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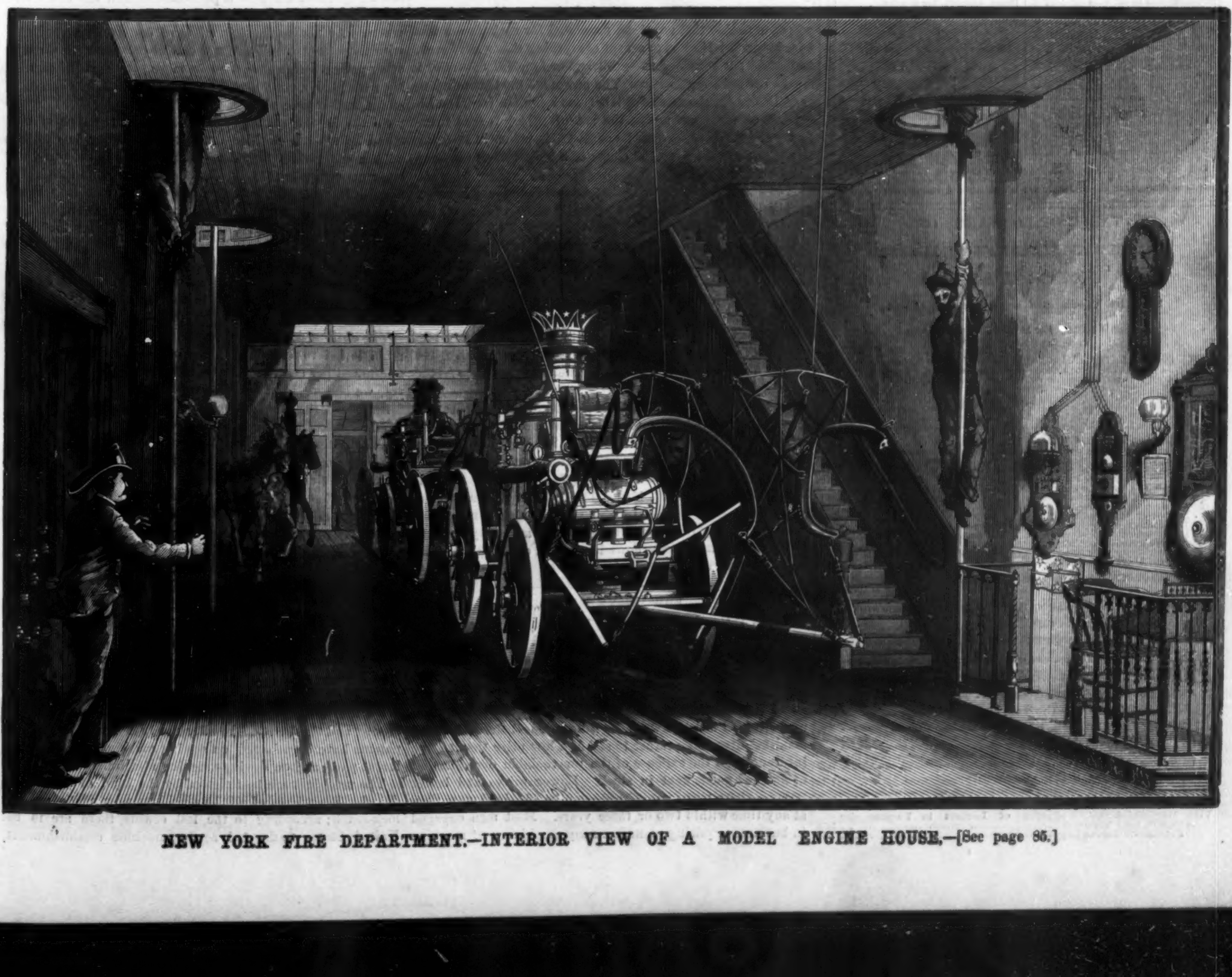
NEW YORK FIRE DEPARTMENT.—THE WATER TOWER.



NEW YORK FIRE DEPARTMENT.—INTERIOR VIEW OF A MODEL ENGINE HOUSE.—[See page 85.]

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 449,

For the Week ending August 9, 1884.

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LABELS AS SUBJECTS OF COPYRIGHT.

The Commissioner of Patents in insisting of his power to rule as to labels and trade-marks, deciding whether the matter for registration is one or the other, seems to consider that both are the subjects of the same or parallel statutes. He acts as if it were his office to divide all marks of designation into two classes, according to some special classification called for by law. On inspection of the statutes no such state of things can be found to exist. Trade-marks derive their standing in the United States courts from enactments under the eighth section of the Constitution of the United States. We give that part which they are referred to: "Sec. 8. Congress shall have power . . . to regulate commerce with foreign nations, and among the several States and with the Indian tribes." The trade-mark act of March 3, 1881, confines its protection to "owners of trade-marks used in commerce with foreign nations or with the Indian tribes." This restriction was inserted to make the act constitutional, as the old act of 1870 had been declared invalid. As it stands it is the authority for the registration of trade-marks in the Patent Office, and has nothing to do with labels.

The law on the subject of trade-marks is very well defined, and is illustrated by many important decisions. Thus the characteristics of a trade-mark are fixed. It must be non-descriptive and arbitrary; otherwise the statute will not apply. The Commissioner of Patents, following the numerous decisions of the courts, exacts this feature before admitting any mark to this kind of registration. He acts properly in doing this, as he is guided by and follows the decisions of the judges of the highest courts.

The *status* of labels is widely different; they are protected as subjects of copyright. Another clause of the same eighth section of the Constitution authorizes the different copyright acts. We quote as before the part relating to this subject: "Sec. 8. The Congress shall have power . . . to promote the progress of science and useful arts by securing for limited times, to authors and inventors, the exclusive right to their respective writings and discoveries." For many years it had been the practice for registrants of labels to register them with the Librarian of Congress, the proper officer, under the old copyright acts. By the act of June 18, 1874, it was provided that ". . . prints or labels designed to be used for any other articles of manufacture" (than pictorial illustrations or works connected with the fine arts) ". . . may be registered in the Patent Office."

It seems as if there were room for much doubt as to whether this act is constitutional. It appears doubtful if a mere label should be protected under a clause of the Constitution designed to secure to *authors* "the right to their respective writings." The inscriber of his own name upon a box of matches would hardly be an author in the sense of the Constitution, and a designating label could not well be considered a writing in the same sense. Much might be said on this point. Yet by statute such protection is accorded, and the Commissioner has nothing to do with the constitutionality or the reverse of these acts.

The Librarian of Congress had under the old practice no power to decide that anything presented for registration was a trade-mark. He had to accept everything that was offered, and could not consider the arbitrary or fanciful nature of a label a bar to its registration. The powers of the Commissioner of Patents in the matter of labels are inherited from the Librarian of Congress under the act of 1874. It seems perfectly clear, therefore, that he exceeds his power in refusing to register anything in the shape of a label because it may be also a trade-mark.

A less technical view may be taken of the case. Leaving aside all court decisions, it is perfectly clear that anything affixed to an article to designate or distinguish it is a label. A trade-mark is defined by law, but a label is not. The Patent Office in its use of Webster's definition of a label as their standard acknowledges this as far as the label is concerned. No technical limitation has been placed on it. It stands as a comprehensive term, including many subdivisions, and among them that of trade-marks. Thus, while anything registrable as a trade-mark should be registrable as a label, the reverse does not hold. The greater includes the less, and the label includes the trade-mark.

For a most clear and interesting statement of the case, we refer our readers to the decision in Willcox & Gibbs S. M. Co. versus E. M. Marble, given by the Supreme Court of the District of Columbia. Although decided on November 30, 1881, it was not published in the *Official Gazette* of the Patent Office until Oct. 17, 1882. The present Commissioner, for some reason, refuses to abide by this decision. What precedent he has for disregarding such an authority does not appear. His predecessor bowed to it, and changed the practice of the office to conform thereto.

NOW IS THE TIME.

"Now is the time to invest in tools and machinery," said a prominent manufacturer of tools and machines a short time ago. "We are making to lay up a stock," he said, "and are keeping our men on the prospects of future sales, instead of paying them from the profits of contracts already made." This company could afford to pay hands and store up a stock of finished work, as it had done before; but the manufacturer chose rather to sell at a low price than to pay insurance and the expense of the unavoidable deterioration of finished goods kept in stock. Lower prices and better terms—where terms are offered—can be obtained now than at any time within two or three years. Most men engaged in business requiring manufacturing machinery or machine tools can anticipate their ordinary needs for a twelvemonth hence, and so can make their preparations for the reflux tide of demand that is as certain to come as is the spring to succeed to winter. Every period of depression in business has been followed by a corresponding uprising, and there is no valid reason for believing that this present season of quietude is to sink into one of stagnation. At all events, a business, to live at all, must have the means, and there appear to be good reasons for advising the purchasing or the contracting for of machine tools and manufacturing machinery now, while in those branches of business there is a temporary lull.

ANOMALIES OF THE SEWING-MACHINE BUSINESS.

IT was John Stuart Mill, we believe, who established the principle that public confidence could neither be stemmed nor directed by statute, and, perhaps, there has rarely been so apt an illustration of this as is to be had in the experience of the original sewing-machine companies. The original sewing-machine patents expired, as is well known, in 1876, and long before that time preparations were afoot to take advantage of the principle, now become common property. Capitalists invested their money freely, great factories were erected, and doubtless many had already figured out their prospective profits for the year when the time to begin the work of manufacturing was at hand and the great struggle began.

There is reason to believe that the original patentees were not a little frightened at the prospect. Indeed, in certain quarters "stampede" would more accurately describe the condition of affairs when the market became "flooded" with sewing-machines, and prices fell to a point at which there was little or no profit, with a premonition that thereafter sewing-machines were to be given away.

This state of affairs had not, however, long continued before the original companies discovered that they were selling about as many machines as before their patents expired, and that, better still, there was a numerous class that did not want the new makes on any conditions; whereat they plucked up their courage.

The fact is, these companies had for years been striving to turn out a finished, efficient, and durable sewing-machine. They would seem to have dealt fairly with their patrons, whose confidence subsequent events proved that they possessed. These patrons became accustomed to the mechanism of a certain kind of sewing machine, and they would have no other. Furthermore, they unconsciously acted as agents for their favorite machine among their friends and acquaintances. All this and more the old companies learned, and, like sensible business men, they no longer tried to sell for a dollar what had cost them one hundred cents.

Do what they would, the new companies, though, no doubt, in some cases turning out an excellent machine, could not get a foothold in the market, and one by one became bankrupt or went out of business. The fact is, this sewing-machine business is phenomenal, and has characteristics which, there is reason to believe, do not obtain elsewhere. As the wandering tribes of equatorial Africa take with them their own idols, nor can be persuaded to worship other gods, though shown to be more potent, so those who have adopted a certain type of sewing-machine cannot, it seems, easily weaned from their choice.

So too in the matter of ornamentation; the type of machine being once decided upon, the purchaser is credited with a disposition to put up with nothing less than all the other exterior arrangements for convenience, and it is stated upon good authority, that a certain class of machines being once fitted with a movable top and three drawers, no patroness, however poor, will thereafter, whatever the extra cost, be contented without them.

A psychological fact, possibly new, which has come to light in this sewing-machine business is that a woman will rather pay $50 for a machine in monthly installments of five dollars than $25 outright, although able to do so.

The curious processes of reasoning by which the feminine mind is led to regard the lapse of time as a cheapener and a hundred per cent. interest as of no consequence, have not yet, we believe, been discovered.

Seriously, the principal original or parent companies are yearly increasing their sales and realizing a fair profit without any patent rights save those pertaining to certain recent improvements. Nine of the newer companies have gone out of business since 1877, and of the forty remaining not a few exist in little else but the name; the field being monopolized by the old established ones or those which, long before the expiration of the sewing-machine patents, had secured the confidence of a large and growing constituency.

This being the case, it may not, perhaps, prove uninteresting to review the sewing-machine field. Elias Howe's sewing-machine, though by no means the first made or used either here or in Europe, was patented in 1846; A. B. Wilson's, 1848; I. M. Singer's, 1851; Grover and Baker's, 1851; the Weed, Finkle & Lyon and Parham, 1854; the Florence, 1855. From 1857 to the present day there have been only a few really new type machines patented, the principal ones being the Willcox & Gibbs, the Empire, the Ætna, the Domestic, and the Victor. In all, since 1846 over two thousand patents have been issued on sewing-machines and their different parts and on sewing-machine attachments.

The machines are best classed by the kind of stitch produced. Four-fifths of all the machines now made use the lock-stitch; according to the last census, there are in the United States to-day 106 sewing-machine establishments,

with an invested capital of $12,301,830, employing 9,283 persons, to whom are annually paid in wages $4,636,099. The value of materials used is figured at $4,829,105, and the value of the products at $13,863,188. Sixteen States monopolize these manufactures, through nearly half of the invested capital and one-half the value of the products are centered in New Jersey and Connecticut.

But, as said before, the original companies hold the field now as they did before their patents expired. Only four of the principal of these extend their operations over the whole range of work on a sewing-machine, beginning with the proprietorship of forests and getting out raw material, to transportation facilities and a network of agencies for disposing of their machines throughout the world.

LATHE FEEDS.

For many years our tool makers have almost universally discarded other feeds for lathes for the screw. Forty years ago, and later, the chain feed was a favorite for all work on the lathe but screw cutting. It had its advantages. So had the rack and pinion feed. Both these feeds took hold of the tool carriage midway between the V-ways, the proper point to avoid a diagonal strain. The rack protected its teeth and those of its pinion from falling chips and dirt, and it could be instantly reversed without much backlash. With it the carriage could be run from end to end of the bed between the heads very rapidly. In fact, many of the screw feed lathes of to-day have their run-back or traversing movement by means of a gear engaging with the threads of the screw, which thus serves as a rack.

As the best of toothed racks and gears are now cut, there is no need of any backlash; the epicycloidal curve to form the contour of the teeth insures a perfectly free rolling action without looseness. Such a cut rack with pinion or wheel would be just as accurate for the finer qualities of lathe work as the screw; and with properly arranged gearing such a feed could be used in screw cutting. In fact, there would be some advantages for some jobs in having a rack and pinion feed instead of the present screw feed. If there should be fear of sufficient wear of the teeth by use to create a backlash which might affect the integrity of the proposed screw, a double disk pinion would obviate this fault.

MUSCULAR CONTRACTION AFTER DEATH.

Dr. Brown-Sequard, SCIENTIFIC AMERICAN, July 12, maintains that fixed and rigid positions after death, speedily ensuing, are due to the last vital act, which has induced a "tonic contraction," and that causes of death which produce sudden dissolutions without pain or excitement may be the means of such a contraction. Assuming this to be true, still the *modus operandi* by which a vital act can leave such a "tonic contraction" after all vital power has ceased is not suggested by him, and we need one step further in the way of enlightenment. Let us see if we cannot take that step now.

In accordance with the observations of Du Bois Reymond, it has been pretty generally accepted that the normal state of even quiescent living muscle is one of electrical tension, and that during muscular contraction the tension diminishes in such a way that as the wave of contraction moves along the muscle it is preceded by a wave of negative variation. This variation is slight for a single contraction, but in those of great rapidity it may become so great as to completely neutralize the galvanometric deflection due to the normal current of the quiescent muscle.

These views have been attacked and sharply criticised, notably by Hermann in 1867, and as lately as 1877 Engelmann has come to Hermann's aid in Pfluger's *Archiv*. They maintain that normal muscle currents do not exist; and that those observed by Du Bois Reymond were due to the unnatural conditions of the muscles examined by him. He, however, has replied to their criticisms with great ability, and his views are now, as already stated, very generally adopted by physiologists. A consideration of these views may perhaps help us to a clearer idea of the position of the headless soldier of Sedan, as shown in Brown-Sequard's figure.

The conditions required, in order that a limb or the entire body should be in a state of rigidity, are simply that the antagonistic muscles, the flexors and extensors, for instance, should be braced at the same moment to full activity, and the rigidity continues so long as the mutual action remains. If this action is not local, but general, such a figure will continue without motion indefinitely, excepting that gravitation may cause it to fall to the ground, if unsupported. But even such a fall would not affect the limbs; they would necessarily retain their position.

Now Du Bois Reymond has shown us that tonic contraction is the *normal state* of muscle fiber, and that relaxation is due to an accession of vital activity through the agency of nerve force. We know well that commonly when life ceases muscular contractility ceases with it. And we can readily see that when death comes as the result of disease or exhaustion, and is attended with suffering, the perturbation of nerve force and of muscle currents must be so great that such a result will surely follow. And as these include death in almost every form in which we ever witness it, we have naturally come to understand that muscular relaxation is its normal attendant and its immediate result. "He bowed his head" is the fearfully expressive term employed when death came on Calvary.

But in the very few instances where death occurs suddenly and without suffering, it seems possible that the instantaneous cessation of the nerve force may leave every muscle fiber in its *normal condition*. If that could be, universal rigidity would instantaneously ensue, and the last position assumed in life would be retained in death. Now we know that the one cause of all causes which can bring a death into which the element of time does not enter is a wound which obliterates the base of the brain as well as the commencement of the spinal cord. That there is an interval between the cause and effect is doubtless theoretically true, but practically the interval has no existence, for it is infinitesimal. Such a stroke must necessarily be painless, for life (including of course sensation) is abolished at its occurrence. The two chief cases cited by Brown-Sequard are cases precisely in point.

The cannon ball at Sedan left nothing remaining above the lower jaw. The brain of the soldier at Goldsborough had been swept by a bullet from a Springfield rifle, that struck him in the right temple, while his head was turned toward his right shoulder, and beyond question inclined downward, for his leg had that instant crossed the saddle, and the stock of his own rifle was still on the ground. Following Du Bois Reymond, it is difficult to see how instantaneous rigidity should not ensue in each of these cases; it did ensue, whether our explanation be correct or not. And with each one the state of support was such that he *could not fall* so long as the rigidity continued.

Many questions and conclusions of intense interest are associated herewith, but for the present we must leave them untouched. W. A. O.

FORMS OF COLD CHISELS.

The cold chisel is not so often used in the shop as formerly, much of its old time work being done by the planer, the milling machine, and the shaper; but the time will never come when it ceases to be one of the most convenient hand tools ever made and used. There are a hundred occasions when it is better than any and all other appliances, and in emergencies it and the hammer are a whole kit of tools combined. But so much has the art of chipping declined that there are shop workmen who do not know the proper form of a cold chisel. Recently an ambitious machinist—a journeyman just out of his time—exhibited a collection of tools "picked up here and there, and made at odd jobs," and among them were some cold chisels, which were worthless as tools unless they were remodeled. The flat chisels had the bit point wider than the blade, and these and the cape chisels had the bit and blade one—a simple wedge extending from the stock to the edge, with a cross section precisely like that of the blade of a pocket knife. With such a chisel there would be no means of raising a chip, and every blow would merely drive the chisel, like a wedge, deeper into the metal until the bit broke off. The widening of the bit beyond the edges of the blade is a certain source of weakness.

The blade of a flat chisel should be flat, of an equal determinate thickness, one-quarter of an inch thick for a blade one inch and an eighth wide, and correspondingly thinner for narrower blades. At the bit, or point, the blade should be ground off at an angle of 60°. Then, the bit should not be quite so wide as the blade; if the blade is one inch let the bit, or edge, be one thirty-second of an inch less. Still another requisite: the cutting edge should not be straight across, but it should form a convex line, so that the corners shall be back of the center of the edge. The ridge between the 60° edge and the flat blade forms a fulcrum for lifting the chip at each successive blow. The narrow cape chisels should be made by similar rules, except, of course, the uniform thickness of the blade, which is impossible, but observing the same narrowing of the bit and the same "stunt" edge of 60°.

It may be asked: How can a clean job be done where corners are required, as in cutting keyways, if the bit is to be narrower than the blade? Simply by using a narrower bladed chisel for finishing the corners. There is no ordinary job that cannot be finished with chisels with bits appreciably narrower than the blades, using differing widths of chisels. It may be that on a cleaning, scraping finish in a keyway a full width chisel with flush bit may be useful, but even here a narrow finishing chisel with drawn-in corners will make better work going down each corner in succession. These elegant, wedge-bladed, spreading bit chisels are beautiful to look at, but they are not necessarily useful because some manufacturers for the trade send them out in this form.

In the article to which reference has been made composite chisels—wrought iron with steel bits—were commended for certain work. It would be well, also, if, when the chisel is made solid from the steel bar, the head or hammer end be occasionally annealed. The continual hammering on the end of the chisel not only brooms and disintegrates the steel, but it hardens it harder than any fire and water can do it, and from this cause come sometimes serious accidents. The writer suffered for years from a disease in the eyes engendered by a flying particle of glass-hard steel from the head of a cold chisel with which he was working.

Fire at the Emerson Saw Works, Beaver Falls, Pa.

The interior of about one-third the area of these works was burned out on the 23d of July. The walls all being of brick and stone are still standing, and none of the roof fallen in. Are fully insured, and with their accustomed enterprise have already commenced rebuilding, and expect to be in operation again inside of two weeks.

Death of Thomas Dickson.

Scotch energy, capacity, and thrift, no less than the manifold opportunities presented to every industrious young citizen of America, were well illustrated in the life of Thomas Dickson, who died July 31, at Morristown, N. J., of heart disease. He was born in Berwickshire, Scotland, in 1822, his parents removing to Canada in 1832, and to Susquehanna County, Penn., in 1834, where Thomas, quarreling with a schoolmaster, hired out at the age of thirteen, to ride a mule in the mines. He then engaged as a clerk, and subsequently became a porter in a country store, afterward purchasing an interest in a foundry and machine shop at Carbondale. In 1856 he took the initiative in starting the Dickson Manufacturing Company at Scranton, Penn., a firm which has been eminently successful in the manufacture of steam engines and mining machinery. Since 1860 Mr. Dickson has been connected with the Delaware and Hudson Canal Company, of which he has been President since 1869, and had become one of the principal owners of coal and iron lands in the country. The output of coal of the company when he took charge was not more than 500,000 tons yearly, while now it exceeds 4,000,000 tons.

The mining operations have been extended over an area of about 44 miles, and, step by step, control has been acquired of a very extensive railroad system. In 1873 Mr. Dickson organized a company with $1,500,000 capital, purchased 23,000 acres of iron land on the shores of Lake Champlain, and erected furnaces, which are producing pig iron and Bessemer. Mr. Dickson was also director in 20 or 30 gas, iron, banking, insurance, and other companies, many of which were planned and organized by himself. In 1879, with his wife and son, he made a trip around the world. He was a member of the Presbyterian Church, and was highly esteemed by a wide circle of friends and acquaintances.

Ready for Any Honest Work.

A recent writer defines "worry"—a trouble which makes many people sick, and even some to die—to be labor done without faith. He means by this, efforts made without confidence in the success aimed at. There is a world of truth in the saying, Courage, always courage! A successful man who overheard a less sanguine person drawl out, "I wish I *could*," turned upon him suddenly with the words, "Say I *will*, and you can!" That is what the energetic man had proved in his own experience, and what many a languid individual might prove too, if he would only once wake up. "Our doubts," the great poet has it, "are traitors."

The passengers and idlers in a certain street in New York were once upon a time amused by the proceedings of a poor fellow whom the police did not interrupt, though his movements gathered crowds, who stopped to look on and inquire. They went their way, admiring a persistence which almost argued insanity. The man had applied at the door of a store for assistance. "You are strong and able," was the answer, "why don't you go to work?" "Work! I would gladly, if any one would give me work to do." "Will you do a day's work if I give you a day's wages?" "Try me," was the answer. "Well, take that brick—put it on the curb at the corner of Nassau Street. Pick it up again and carry it to the corner of the Park. There lay it down. Take it up again and carry it back. Repeat the walk until working hours are over, and I will pay you a day's wages." If the man who gave this apparently senseless direction imagined that the other would refuse the arrangement, he was mistaken. The man took him at his word, plodded on through a long summer day, and received not only his money, but the applause of the crowd, quite as well bestowed as those upon the victor in any walking match.

If he had "worried" over such questions as "What is the use?" he could not have done it. His aim was to honestly earn a day's wages, and he accomplished it. It was not, to be sure, a very ambitious purpose, or a very dignified employment of muscle without mind. But it was done without "worry," and he survived that day and provided for himself food for the next. And it is safe to say that man got around all right in other employment. He was a philosopher in humble attire, capable of teaching many a more pretentious individual, with ample means, one great secret of life. We have only one day at a time to live in, and it is never worth while to shorten the work of that day, while we lengthen the hours in weary speculations as to the utility of any honest pursuit, or in doubts as to results. "Meeting trouble half way" is, in the timid sense, even more foolish than "dropping buckets into empty wells, and growing weary drawing nothing up." The world and its doings are made up of trifles, any way—some sad, some glad, and others foolish. But any honest folly which *pays* is better than worry, which is usually only compensated, when the best comes, or the worst is over, with the reflection, "What a flat I was!"—*Phila. Ledger.*

The Venerable Captain Ericsson,

The inventor of the *monitors* which did such useful service during our war with the South, and the author of the sun motor, the hot air engine which bears his name, and scores of other inventions, reached his eighty-first birthday on the 20th of July. Captain Ericsson does not look or appear to be a man much past sixty years of age, and he seems as hale and hearty as he did a quarter of a century ago. Captain Ericsson is very methodical in all of his ways, abstemious in his habits, and is always at work; he begins immediately after an early breakfast, and is so busy with tools or pen for sixteen hours of every twenty-four that no one ever finds him at leisure.

The Doorway of Furnaces.

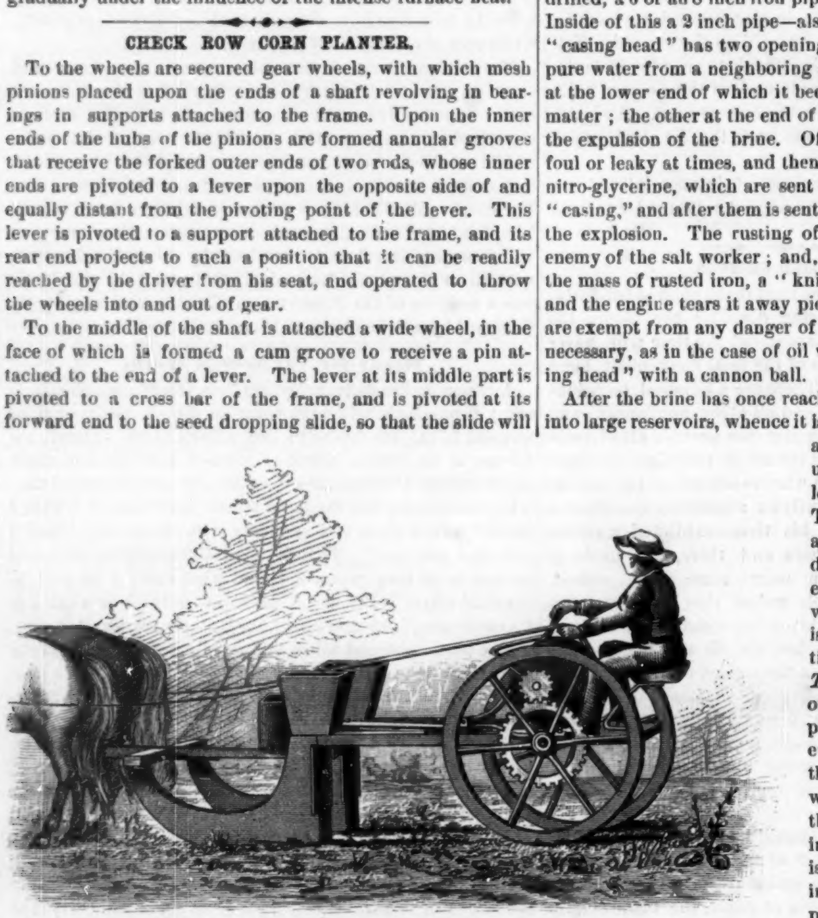
The *Locomotive* concludes that probably every man who owns or has run a boiler has experienced a vast deal of trouble with the cast iron mouth pieces around the furnace doors. These pieces invariably warp, crack, and burn out in a short time, and the firebrick lining falls down, the cast iron front becomes burned, and where the boilers are set with the flush front setting the portion of the shell which projects beyond the front tube sheet gets overheated, which generally results in its fracture, and in many cases the longitudinal seam where the head is attached to the shell is so severely strained that it begins to leak, and sometimes this leakage is very difficult to stop, owing to the joint being permanently strained. This warping and burning away of these castings may be prevented by simply slitting them back from the edge for about one-half their depth. The slots should be from one-half to one-fourth of an inch in width, and may be from eight to twelve inches apart over the furnace door. This width is necessary, as they close up gradually under the influence of the intense furnace heat.

CHECK ROW CORN PLANTER.

To the wheels are secured gear wheels, with which mesh pinions placed upon the ends of a shaft revolving in bearings in supports attached to the frame. Upon the inner ends of the hubs of the pinions are formed annular grooves that receive the forked outer ends of two rods, whose inner ends are pivoted to a lever upon the opposite side of and equally distant from the pivoting point of the lever. This lever is pivoted to a support attached to the frame, and its rear end projects to such a position that it can be readily reached by the driver from his seat, and operated to throw the wheels into and out of gear.

To the middle of the shaft is attached a wide wheel, in the face of which is formed a cam groove to receive a pin attached to the end of a lever. The lever at its middle part is pivoted to a cross bar of the frame, and is pivoted at its forward end to the seed dropping slide, so that the slide will be operated to drop the seed by the advance of the machine. To the center of the seed dropping slide is attached the rear end of an arm whose forward end enters a slot in a hopper, so that lime, plaster, sand, or other white substance may be dropped from the hopper to the ground. This hopper is attached to the center bars of the forward part of the frame, a little in front of the line of the seed hoppers, and in such a position that the white substance dropped from it will fall upon the ground midway between and in a line with the hills, so as to mark the cross rows and thus enable the driver to plant the corn in accurate check row. By means of a lever attached to a pawl engaging with a ratchet wheel on the pinion shaft, the driver is enabled to adjust the seed dropping mechanism when starting in at the side of the field and at any time when the cross rows get out of true.

This invention has been patented by Messrs. E. P. Barrett and J. A. Forster, of Holden, Mo.



BARRETT & FORSTER'S CHECK ROW CORN PLANTER.

The Clock in Trinity's Tower.

The clock in Trinity Church tower in this city is the heaviest in America. The frame stands nine feet long, five feet high, and three feet wide. The main wheels are thirty inches in diameter. There are three wheels in the time train, and three each in the strike and the chime. The winding wheels are formed of solid castings thirty inches in diameter and two inches thick, and are driven by a "pinion and arbor." On this arbor is placed a jack, or another wheel, pinion and crank, and it takes 850 turns of this crank to wind each weight up. It requires 700 feet of three inch rope for the three cords, and over an hour for two men to wind the clock. The pendulum is eighteen feet long, and oscillates twenty-five times per minute. The dials are eight feet in diameter, although they look little more than half that size from Broadway. The three weights are about eight hundred, twelve hundred, and fifteen hundred pounds respectively. A large box is placed at the bottom of the well that holds about a bale of cotton waste, so that if a cord should break the cotton would check the concussion.

THAT time-honored association, the Massachusetts Charitable Mechanics, holds its fifteenth exhibition this year, at Boston, beginning September 10. See advertisement.

Glass Bearings.

Bearings made of glass are now being experimented with in the rolling stock of railroads, in regard to their frictionless quality. This material is a hard, clear substance, and must wear down smooth and give a fine bearing surface for an axle to rest upon. It is a non-conductor of electricity, if not of heat, and the fine particles have as good a chance to work down the bearing of the axle to a running fit as in the grinding in of a valve seat for a brass valve, and much power is expected to be saved by converting the wearing of a journal into some other agency than by converting it into heat.

How a Salt Well is Worked.

The stratum of salt having been once pierced, a saturated solution of the saline matter frequently rises in the boring to within eighty feet of the surface. This, however, cannot always be depended upon—and here center the increased difficulty and expense. When a few dozen feet have been drilled, a 6 or an 8 inch iron pipe is inserted as a "casing." Inside of this a 2 inch pipe—also of iron—is placed. The "casing head" has two openings—one for the entrance of pure water from a neighboring spring into the larger pipe, at the lower end of which it becomes saturated with saline matter; the other at the end of the smaller pipe, to allow the expulsion of the brine. Of course, the wells become foul or leaky at times, and then resort is had to torpedoes of nitro-glycerine, which are sent down to the bottom of the "casing," and after them is sent an iron weight which secures the explosion. The rusting of the "casing" is the great enemy of the salt worker; and, when his engine cannot lift the mass of rusted iron, a "knife" cuts the rusted metal, and the engine tears it away piecemeal. But the salt wells are exempt from any danger of taking fire; and it is never necessary, as in the case of oil wells, to shoot off the "casing head" with a cannon ball.

After the brine has once reached the surface it is forced into large reservoirs, whence it is drawn off through "string" after "string" of "covers," until solar evaporation has left the coarser grades of salt. The "covers" or vats are usually 16x18 feet, and the product to each one per year is estimated at 150 bushels; while the product at Syracuse is only about half that quantity. It is also claimed, adds *The Age of Steel*, that the slope of the valley at Warsaw is peculiarly adapted to rapid evaporation by the sun. When the finer grades of salt are wanted, the brine is led from the reservoirs to an evaporating pan, where a gentle heat is applied. Similar treatment in another pan completes the process, and the residuum of salt is raked upon a shelf at the side of the evaporator. After a slight draining it is taken to the bins, where a more thorough draining is allowed for a space of two or three weeks.

SLIDE TROMBONE VALVE FOR CORNETS, ETC.

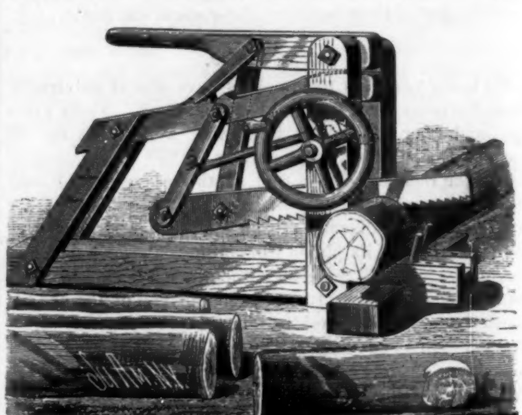
The body of the instrument between the mouth piece and bell is wholly severed once or more for the purpose of connecting with one or more extensions, in order that the tone may be changed by thus increasing the tubular length of the air passage. To make and break this connection at will a peculiar slide valve is interposed, in which one or more flanged and lipped plates, fixed to the body of the instrument, serve to guide one or more valve plates. Each plate carries two short tubes, one of which is telescoped at one end with the body of the instrument, and at its other end is secured in the plate, through which it communicates with the body when in its normal position; the second tube is wholly mounted on the sliding plate, and both ends open through the plate. Mounted on the fixed plate is an extension, both ends of which open through the plate. One end of the body opens through the fixed plate, and the other end may extend directly to the bell, or to the telescoping end of another slide valve. Each slide valve is provided with a poppet having a spring which raises the valve to its upper position, in which condition the air passage from the mouth piece to the bell is through the shortest tube connection. When a poppet is pressed down, the length of both the movable and fixed tubes is added to the air passage by a quick movement of the operator's finger. These interposed tubes may be of any suitable length, and any desired number of valves may be added to a single instrument.

Made after this plan there are three fixed parts, three sliding parts, and a telescoping joint, making eight pipe ends that are brought to connect in two different ways by pressing or releasing a single poppet. The telescoping joint prevents disturbing the vibrations in the instrument during the instant of sliding the valve. While only two very short and light tubes are carried by the slide valve, they serve to connect a tube of any desired length with the air passage, there by preventing friction and requiring but a slight pressure of the finger to operate the valve.

This invention has been patented by Mr. G. W. L Schweich, of Richmond, Missouri.

DRAG SAW

On one end of the base are secured two standards in which is journaled a transverse shaft, upon one end of which is mounted a wheel provided with a crank handle. A top beam is held between the upper parts of these standards, and two inclined standards fastened to the rear end of the base. To the lower end of a connecting bar pivoted to the side of the top beam is pivoted the butt end of the saw that projects between the forward standards. This bar is connected by a rod with a crank on the shaft, so that by revolving the latter the saw will be reciprocated. Pivoted to the forward standards is a lever which is connected by a rod to the saw a short distance in front of the butt end. On the top edge of the top beam are formed teeth, against which rests the free end of a pawl pivoted to the lever. The front of the base is supported upon a transverse beam, and in the upper surface of this part of the base is a groove at the sides of which are apertures for receiving the pins for holding the log in place. The groove receives the edge of the saw after it has passed through the log. By means of the lever and pawl the saw can be raised and held in any desired position. By increasing the height of the rear standards so as to accommodate the lever, the saw can be reversed so as to project from the rear.



CRAWFORD'S DRAG SAW.

This invention has been patented by Mr. Edward F. Crawford, of Honey Bend, Ill.

About Bricks.

An average day's work for a brick layer is 1,500 bricks on outside and inside walls; on facings and angles, and finishing around wood or stone work, not more than half of this number can be laid. To find the number of bricks in a wall, first determine the number of square feet of surface, and then multiply by 7 for a 4 inch wall, by 14 for an 8 inch wall, by 21 for a 12 inch wall, and by 28 for a 16 inch wall. For staining bricks red, melt one ounce of glue in one gallon of water; add a piece of alum the size of an egg, then one-half pound of Venetian red and one pound of Spanish brown. Try the color on the bricks before using, and change to light or dark with the red or brown, using a yellow mineral for buff. For coloring black, heat asphaltum to a fluid state, and moderately heat true surface bricks and dip them. Or, make a hot mixture of linseed oil and asphalt, heat the bricks, and dip them. Tar and asphalt are also used for the same purpose. It is important that the bricks be sufficiently hot, and be held in the mixture to absorb the color to the depth of one sixteenth of an inch.—*The California Architect.*

SCHWEICH'S SLIDE TROMBONE VALVE FOR CORNETS, ETC.

Germ-ane.

The *Phrenological Journal* has coined the above word to meet recent microscopical discoveries, and proceeds to describe some of them as follows: We are living in an ocean of infectious germs. So the microscopists tell us. With the recent improvement in lenses and methods of examination, a world of minute life has been revealed that should be most startling to every one who reads about the spores, bacteria, bacilli, micrococci, etc., etc., that render whatever we eat or drink tremulous with parasitic life. The atmosphere teems with an infinite detail of germs, each one ready to pounce upon our soft tissues for a contribution to its greedy maw.

Every breath takes in a countless host of these creatures to riot on our delicate "innards." What fastidious appetites the brutes must have! for some show a special preference for dainty protoplasmic bits of liver, or kidney, or heart; while others make imperative demands upon the choicest of our neurilemms, or are found at table in the most retired chambers of the brain. What are we to do about it? Must all our fair dreams of development, progress, civilization, be regarded as arrant delusions; and must all our hopes of health and longevity go down before the advancing hosts of invisible imps that Koch and Pasteur, Crudelli, and Schmidt and Grassi tell us are only the vanguard of zymosis and contagion?

One tells us that we must beware of flies; even that familiar little impertinent that has buzzed in our homes for centuries, has made himself welcome to everything nice on our dining table, is teeming with creatures whose names are witnesses to their terrible characters—as the *tricocephalus dispar, oxyuris vermicularis, tænia solium, oidium lactis*, and so on. Even our books and newspapers, freshly drawn from the vender's shelves, and apparently pure and bright, are loaded with infectious little scamps. A German, who squints through high angled objectives, points a new moral to the old apostolic warning of evil in many, by assuring us that the loose change we may jingle in our pockets is coated with animal life, very dangerous to health; and then, O oyster and clam eater! know that in the tissues of your favorite bivalve lurk those relentless foes of family peace, scarlatina, diphtheria, and other frightful things whose habitat is the human fauces!

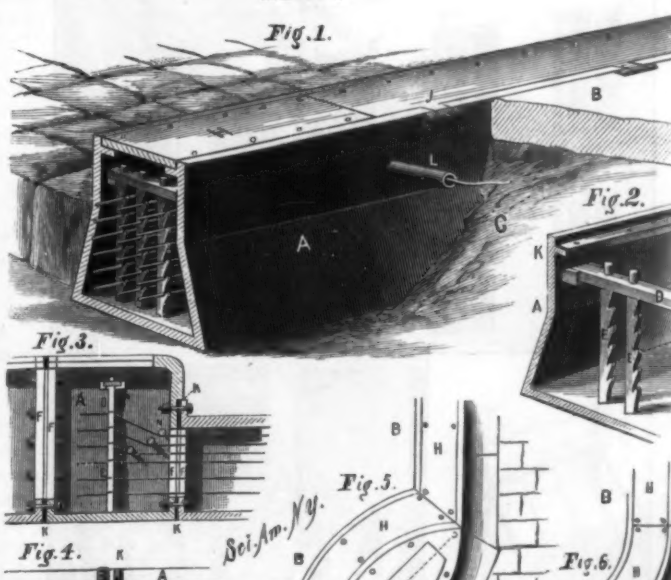
We tremble as we contemplate the situation. What are we going to do about it? Oh, let the manufactures of disinfectants be multiplied; let the disease-breeding atmosphere be made redolent with sulphur fumes, carbolic acid, chloride of lead, zinc, copperas! and let everything that is germicidal be thickly spread over our food and drink! Hurry, hurry, hurry, ye chemists, with your potent mixtures, and relieve us from being the unwilling habitations of lively bacteria and bacilli, of tænia and ascaride, who are sworn against our mortal comfort and physical integrity.

COMBINED CURBSTONE AND TELEGRAPH WIRE CONDUIT.

In the accompanying engraving, Fig. 1 is a perspective view of the combined curbstone and conduit, showing the wires in position; in the second figure the wires and cover are removed; Fig. 3 is a vertical section taken at a street corner; and Figs. 5 and 6 are plan views at street corners, the former being an inlet corner and the latter the usual rounded corner; Fig. 4 is a horizontal section illustrating the method of securing together the conduit sections in order to permit expansion and contraction. The hollow curb conduit sections, A, made of cast iron or other suitable material, are formed with vertical sides above the street pavement to form the curb, and those portions sunk in the ground have outwardly flaring sides to insure against displacement and provide ample space. The cover, J, is about flush with the sidewalk. Between the cover and the top of the ledges is placed a water tight packing. The wires are supported by a series of vertical racks, E, located at suitable intervals apart. The lower ends of the racks enter sockets in the bottom of the conduit, while their upper ends pass through holes in cross stays, D, whose extremities rest in brackets in the sides. The ends of the conduit sections are flanged and bolted together, packing being inserted between them.

When it it necessary to provide for longitudinal expansion and contraction of the several sections, they are made with overlapping ends, and are secured by bolts passing through slots in one of the flanges. Packing is placed between the joints. The wires are inserted from the open top of the conduit, and rest in the teeth of the racks; after they are in position the cover is bolted down. When it is desired to conduct one or more wires into a building small lateral pipes, L, are connected to the side of the conduit. With this construction the wires are always easily accessible, and the tearing up of the pavement in order to reach particular points is obviated. The two plan views show clearly the methods of rounding corners. When the conduit crosses the street where the curb ends, those wires which are above the line of the depressed part are directed downward (Fig. 3), and kept in place by means of transverse studs, *n*.

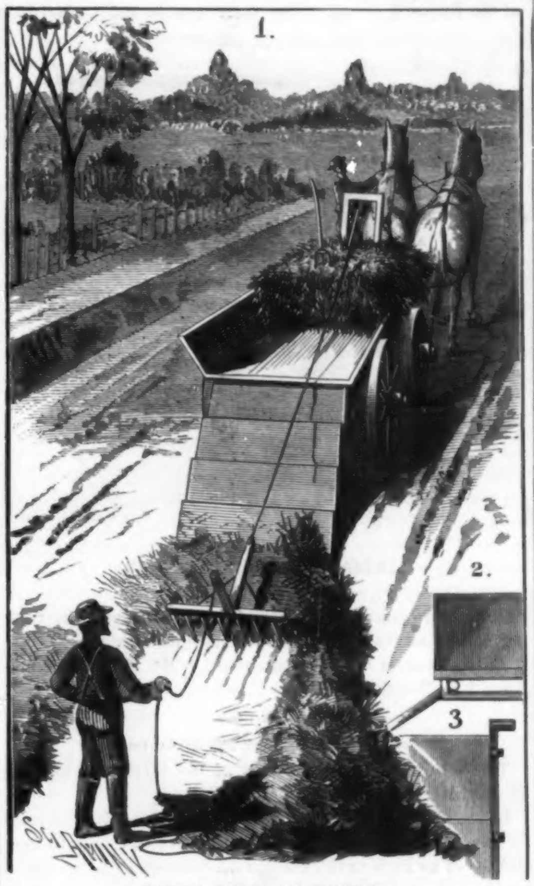
This invention has been patented by Mr. James S. Woodward, of 132 Chestnut Street, Philadelphia, Pa.



WOODWARD'S COMBINED CURBSTONE AND TELEGRAPH WIRE CONDUIT.

MANURE LOADER.

At the tail end of the wagon box is arranged an inclined apron, upon which the manure is hauled up into the box by a rake, to which is connected a rope extending over a guide pulley suspended over the front end of the box by an upright frame. Upon the other end of the rope are whiffletrees for hitching on a team. The rake is pulled back by means of a cord fastened to the head of the rake. The apron is so



DAVIS' MANURE LOADER.

arranged as to slide under the bottom of the wagon on guides, but it may be made detachable. The apron is preferably formed of sheet metal or other plates having hooks attached at the upper corners, which slide upon side bars having outwardly bent ends (Figs. 2 and 3). The upper ends of the plates are turned down and their lower ends turned up. The ends of the side rods slide on the guides beneath the wagon, while the plates slide under each other. By this plan a simple and efficient contrivance is obtained for loading manure into the wagon, and by its use manual labor is greatly economized. This invention has been patented by Mr. Henry C. Davis, of Willow Grove, Pa.

The Brazilian War Steamer Riachuelo.

An inspection has just taken place, says the London *Times*, of what has been publicly pronounced on high authority to be one of the most valuable additions to the armor-clad vessels of the world that can be imagined. This is the Riachuelo, Brazilian armor-clad turret ship, which may be taken as being the most perfect fighting ship afloat. The Riachuelo is a twin-screw ship of 6,000 tons displacement and 6,000 horse power, and she possesses in speed, coal endurance (or the capability of steaming without recoaling), and the arrangement and range of fire of her guns special advantages which we believe have not been previously attained in combination in any other ship. She is 305 feet long, 52 feet extreme beam on water line, and 30 feet extreme depth, her displacement tonnage being 5,700 tons at load line. Her draught of water at load line with 400 tons of coal in her bunkers is 19 feet 6 inches. Her estimated speed with 872 tons of dead weight on board is 15 knots an hour, but on her official trials she attained a speed of 16¼ knots with a natural draught, and 16½ knots with a forced draught. She is protected by armor 11 inches and 10 inches thick respectively, and her armament consists of four 9 inch 20 ton breechloading rifled guns in two revolving turrets, and six 6 inch breechloaders, besides fifteen Nordenfelt machine guns. She also carries Whitehead torpedoes.

Looking a little into the details of her construction, we may observe that her hull is built entirely of Siemens-Martin steel, and that her armor is compound or steel-faced, and consists of a belt 250 feet long and 11 inches thick amidships, where it protects engines, boilers, and magazines. It is then reduced to 10 inches thick, while for a depth of 4 feet below water line the armor is partly 10 inches and partly 7 inches thick. Beyond the 250 feet of side armor, at both ends inclined armor 3 inches thick is placed internally at an angle of fifteen degrees, and reaching from the top of the side armor to the stem and stern respectively. This 3 inch armor is so arranged that it measures and equals 10 inches of vertical armor if struck in a horizontal position. The inclined armor is useful for supporting and giving additional strength to the ram forward, while aft it protects the rudder head, tiller, and steering gear. A horizontal deck of 2 inch steel armor runs through the ship and joins the inclined armor at each end. On this are two oval breastworks built up of plates and angles, and protected by 10 inch armor plates and teak backing.

Within the breastworks are two revolving turrets similarly built up and protected, and in each of these are two of the 20 ton guns. A very important feature in connection with these breastworks is that they are *en echelon*, and are so carried out as to enable the guns in each turret to command an unbroken fire for 180 degrees on their own side of the vessel, and 50 degrees on the opposite side. Thus the whole four guns can be brought to bear ahead or astern, while an all-around fire can be always maintained with two guns, and all four of them can be used for broadside firing on either side of the ship. The guns are loaded by hydraulic machinery, and the turrets are revolved by similar means. The six 70 pounder guns are placed on the upper deck, while of the fifteen Nordenfelt machine guns, five are for use in the mast tops, and the remainder are placed on pedestals so as to keep off torpedo boats. The torpedo guns are arranged to fir from 5 ports, 4 broadside and 1 right aft.

The engines of the Riachuelo are of 6,000 horse power indicated, and of the vertical twin screw type. Each set of engines has one high pressure cylinder of 52 inches diameter placed between two low pressure cylinders, each 74 inches diameter, with a 3 foot stroke, and making from 80 to 90 revolutions per minute. Steam is supplied from ten boilers working at 90-pound pressure, and containing a total heating surface of 19,400 square feet. Although designed to give, when working at her full power of 6,000 horses, a speed of 15 knots an hour and to have at that speed a coal endurance for five days' working, she developed on her trials a 15 knot speed with only 4,500 horse power. Hence at that speed she can run a distance of 4,500 miles without recoaling. In other words, the coal supply of 800 tons is sufficient for 12 days' steaming at 15 knots an hour.

Diagrams of this ship and other particulars will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 438.

Steel Made and Reworked.

Some tests have been made of steel from the roll and from the hammer as compared with steel that is annealed and turned to size. It appears from these tests that the commercial steel, untouched by annealing heat, or by the turning tool, is better in its resistant qualities than the annealed and turned material. Unannealed steel is tougher—it resists torsion better—than annealed steel. This fact was constant through a large number of tests of the steel made by five of the most prominent and best known manufacturers. Further trials proved the fact that steel as it comes from the hammer is better for certain tools than the same steel annealed, turned, and after worked. A square bar of commercial steel centered and cut to thread made a better tap than the same bar annealed and turned round, and then four-scored and retempered. It is possible that for certain tools—lengthwise tools—as taps and reamers, steel might be forged in bars to size and shape, with advantage, not alone as to saving of lathe work, but as to value of the finished tool. If steel makers can be induced by sufficient orders, it is probable the experiment will be made on a scale large enough to establish the question of its value. The claim of those who have made the tests is that the "skin" of the steel as it comes from under the hammer is stronger than any after coating by the oxidizing of tempering.

Tucker Bronze.

A New Haven correspondent sends us the following very complete answer to a recent inquiry: Tucker bronze is the result of the compound oxidation by heat of cast iron and linseed oil. The cast iron is cleaned, polished if desired, coated thinly with linseed oil or varnish containing linseed oil, and subjected to a heat sufficient to oxidize the iron, say 420°, for a light yellowish color, and higher for darker tints. The color, which is modified by the oil, may be of any desired shade which can be derived from the action of heat on iron. By carrying the heat to 600° and repeating the operation, a quality of black japan is obtained which can be hammered without injuring its polish. Carriage buttons are made in this way.

The finish is very durable and, on work partly polished, beautiful.

It is the common way of finishing all kinds of cast iron house furnishing goods. Tucker, the inventor, obtained a patent in 1863, which has been the subject of much litigation. He committed suicide some time ago by breathing illuminating gas through a rubber tube, attached to a gas burner.

IMPROVED FIRE ESCAPE.

The engraving shows a flexible ladder fire escape, designed mainly for use from the window sills of buildings, which was recently patented by Mr. William Jensen, of Victoria, British Columbia, Canada. A flexible steel wire rope ladder of any required length is made up of three longitudinal strands—the outer ones of which diverge from each other in a downward direction—that are connected by cross strands to form steps. At every eight feet is placed a rigid step, consisting of a steel bar, in order to keep the ladder well spread. This construction combines lightness with strength and makes a fireproof ladder which, when extended from the window sill to the ground, has all the necessary stability without the aid of side braces, the lower, spreading end forming a wide base. By means of long steel pins driven in between the paving stones the lower end of the ladder is fastened to the ground; the inclination of the ladder not only facilitating the ascent of firemen, but also protecting persons ascending or descending from being burned by any flames issuing from the windows of the lower stories of the building. The entire fire escape is galvanized in order to protect it from dampness, and each longitudinal strand is guaranteed to sustain a load of 3,500 pounds.

The opposite end of the ladder is fastened to the barrel of a portable windlass (shown very clearly in the small cut) of a suitable size to sit upon the window sill. The barrel is mounted in a frame consisting of side standards united by stay rods and stiffened by front braces. The frame is formed into long legs which, when the windlass is placed on the sill, enter corresponding cast iron sockets inserted in the sill, thereby firmly holding the windlass in place. The sockets have stoppers to prevent dirt from collecting in them when the fire escape is not in use. The barrel is operated by a handle on one or both ends, and on removing the lower pins the ladder may be easily wound up and the whole apparatus packed away in a box ready for immediate use in case of danger. The box is kept inside the room, and may be of an ornamental or useful character, and may be carried from window to window as required. The weight of windlass and ladder for a five-story building is only from 80 to 85 pounds, the length being about 60 feet. In a trial in San Francisco, the ladder was placed in an upper window of the Appraiser's building, lowered, and the spikes driven in the ground in the space of one minute, ready for people to ascend.

This invention has also been patented in England, where it is meeting with much success. Further information may be obtained by addressing the patentee.

Opening of a New Electric Street Railroad.

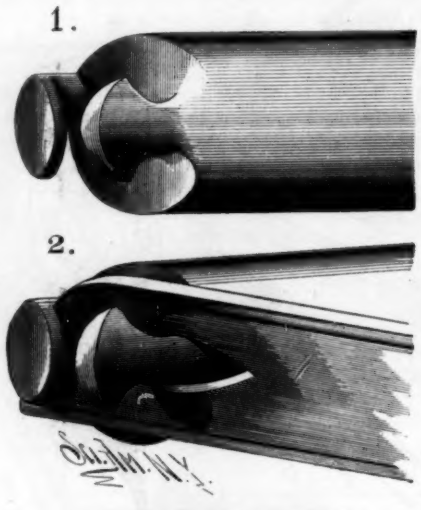
The first electric railroad for public use in America went into operation in Cleveland, O., July 26, in connection with the East Cleveland Street Railroad Company, who have just completed a mile road. The experiment was so successful that the company expect to change their entire system, comprising over twenty miles, into electric roads. The system used was a combination of the Brush and Knight & Bentley systems, and the current was carried on underground conductors, laid in conduits like those of cable roads. The cars were started and stopped and reversed with the greatest ease. Any number of cars up to fifteen can be run at one time on a single circuit and from one machine.

Wide Reach of a Tidal Wave.

A correspondent in the Fiji Islands writes us that a notable tidal wave reached there on October 6 last, the date of the great tidal wave, 25 feet high, and the eruption of Mount St. Augustin, in Alaska. The tidal wave in Alaska occurred at 8:25 A.M., and that at the Fiji Islands, about 4,500 miles to the southwest, at 11:45 A.M. At the latter place there were three successive waves, with intervals of ten minutes, which, at the ordinary period of low water, reached nearly to the high water mark. The occurrence of this disturbance of the sea a few hours later on the same day as the eruption of Mount St. Augustin, and the formation of a new island in its vicinity, suggests that the tidal wave at both places proceeded from the same cause.

TRACE FASTENER.

The ferrule fitting on the end of the single tree is provided on its end with two prongs, the forward one of which is formed with a recess in its top and bottom edges, thereby making a vertical end flange, and the rear prong has a flange parallel with the end of the ferrule and projecting downward and toward the front. In the end of the trace is a longitudinal eye tapered toward the ends, as is also the end of the forward prong. The trace can be easily placed on



LINDSAY'S TRACE FASTENER.

or detached from the ferrule, and since no spring or movable parts are used, the device cannot get out of order.

This invention has been patented by Mr. Ralph E. Lindsay, of Neillsville, Wis.

How Tin Plates are Manufactured.

The following is the process at the Dyffryn Tin Plate Works, Morriston, near Swansea, Wales:

In the first place we have what is termed bar iron, several feet long, about 7 inches wide, and from one-half to five-eighths of an inch in thickness, rolled according to the plates required at so many pounds per foot. It is cut in what may be termed a jack-in-the-box or steam shear, say about nineteen pounds, to a piece which will eventually be rolled into sixteen sheets of 20 inches long by 14 inches wide, 112 of such sheets forming a box, and weighing when tinned nearly one cwt.

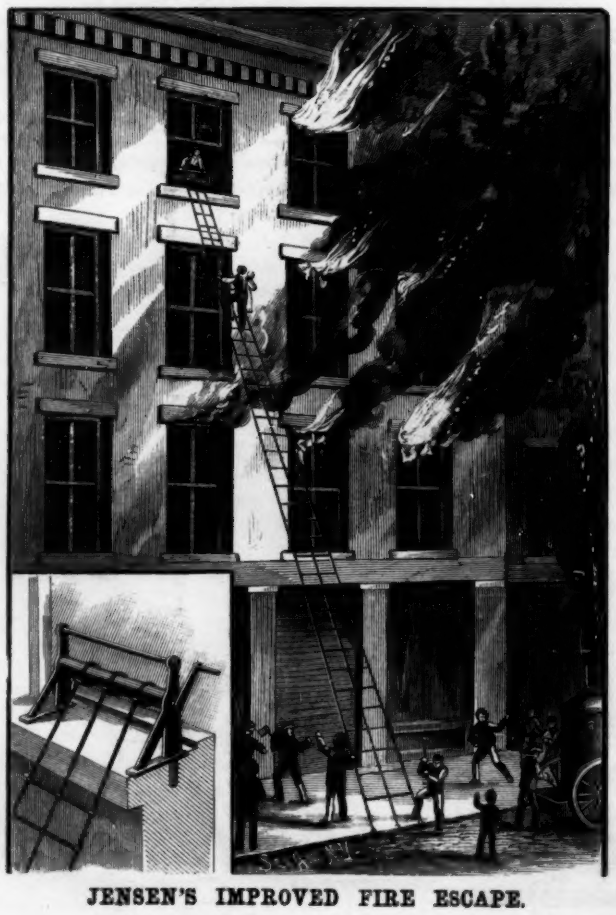
This piece of iron is first placed in a reverberatory furnace, heated to redness, put through the chilled rolls, and rolled in what is termed thicks five times; reheated, and rolled in singles twice; doubled, reheated, and rolled three times, doubled, reheated, and rolled twice; doubled, reheated, and rolled in eighths twice, until they are stretched out to the required length and thickness. The length of the bar exceeds by about one inch the width of the sheet to be made, so as to allow for the shearing process, and the bar is therefore rolled with its axis parallel to that of the rolls. Great attention is necessary in the construction and management of the mill furnaces, so that the heating of the bar and sheet for rolling may be effected with the utmost regularity, and without the formation of scale on the surface of the bars or sheets; for when scaling takes place from the draught in the furnace being too keen or the heat raised too high, the quality of the iron is injured; the scale, if subsequently rolled into the iron, leaves a rough surface on the plates in the after process of separating and pickling. The plates are then sheared, and the rough edges taken off. The iron of nineteen pounds or thereabouts makes sixteen sheets, which, being cut in halves, leaves eight sheets in a piece closely wedged. Girls with small iron hatchets open or separate them. They are then termed black plate. From one ton of bar iron about 16¾ cwt. of black plate is made; the loss is termed shearings, and is worked up again in the forge fineries. The plates are next sent to be pickled, *i. e.*, immersed in heated dilute sulphuric acid, known as oil of vitriol.

The plates are placed in a cradle or receptacle, lifted by a hydraulic, then dropped down into a round wooden or lead tank containing the acid; the cradle is then made to revolve by means of steam power, to enable the liquid to rush between the sheets, which revolution is retained. They are lifted again by the hydraulic, dropped into a tub, a little apart from the last, containing water only, the cradle revolving as in last tub, so that the water may rush between the sheets to cleanse or wash away all trace of the acid; when taken up again, the plates are clean and bright as silver.

The plates are next subjected to a bright red heat, which lasts from twelve to twenty-four hours, in closed iron annealing pots in a reverberatory furnace; they are well covered on the top to prevent the plates from being burnt, the heat is kept as high as it can be without softening them to such a degree as to the cause them to stick so fast together as to prevent their separation when cold.

They next pass singly through cold rolls, three, four, or more times, as may be deemed requisite. These rolls are highly polished, and must be set in accurate order to give the plates a perfectly flat set and well polished surface. Again they are annealed or softened at a lower temperature than the first, as their surfaces would be damaged by being in any degree stuck together. Pickled again as before, excepting that the liquid is considerably weaker than previously, placed in cast iron troughs containing clean water renewed by a stream constantly flowing through—they are then taken in hand singly, and scoured if necessary with sand and hempen pads before being delivered to the tinman.

Now comes the last process. The sheets are iron only so far. They next reach the tin house, and are placed in a trough containing clean water, ready for the tinman, as he is termed, who then picks them up and puts them singly in a grease pan containing palm oil, to soak, and after being there for a short time, the tinman places the sheets in a large iron pot containing molten tin, with a covering of palm oil. Here it unites with the tin, to which it has a strong affinity; when he has performed his part the plates are handed over to the next man, called a washman, whose pot contains pure molten tin; after they have soaked in his pot a little, he raises them with a tongs on to the hob as he requires them, brushes the surfaces of both sides of each sheet, and after dipping them into another pot containing molten tin again, they are sent through rolls which work in a large pot containing palm oil, and the speed at which the rolls move regulates the quantity of tin to be put on each sheet. They are afterward raised from the rolls (under which they have been passing) by a youth called a riser, handed to two young women who rub them in bins or boxes containing bran, one after the other, which takes off the grease; another girl, called a duster, gives them a further polish with a skin duster, and takes them to the assorting room, where every plate passes inspection, and if not up to the mark is sent back for rectification. After passing through that ordeal, they are counted and weighed and made up into boxes.



JENSEN'S IMPROVED FIRE ESCAPE.

Bleaching Sponges.

As well known, chlorine and its compounds are unfitted for bleaching sponges, since they give the latter a yellow color, harden them, and cause them to lose their fineness. What is usually employed is an aqueous solution of sulphurous acid. This treatment takes seven or eight days, and requires considerable manipulation. Some recent researches made in Germany seem to indicate that the bleaching of sponges may be more easily and quickly effected by means of a solution of bromine in water. One part of bromine requires thirty parts of water to dissolve it. It will be only necessary, then, in order to have a concentrated solution of bromine, to pour a few drops of liquid bromine into a bottle of distilled water, and then shake it up. The sponges are immersed in this solution, and, after a few hours, their brown color will disappear and give place to a much lighter tint. Upon treating the sponges a second time in the same way they will acquire the desired shade. They are still further improved by afterward dipping them into dilute sulphuric acid and then washing them in several waters.—*Annales Industrielles.*

Machines for Rolling and Curing Tea.

A correspondent writes us that five different machines have been invented and are in use in India for this purpose, there being more than a thousand such machines employed there.

THE NEW YORK FIRE DEPARTMENT.

Although the single swing of a pendulum only measures a second of time, yet each one of these periods may be so intimately and directly connected with events of such vital interest as to become of the greatest importance. It is doubtful if there be any moment, in any calling, in which so many movements bearing immediately upon the result are crowded as in the fire department when an alarm is received. The ease with which an incipient fire can be extinguished, and the fearful rapidity with which it spreads and gets beyond control, compelled the adoption of every device and method that would in any way lessen the time intervening between the alarm and the arrival at the fire. Consequently each fraction of a second is carefully guarded lest it escape before having seen the performance of some step tending toward the accomplishment of the main object. The seeming confusion, the apparent mixing up of men, horses, and machinery, is the outcome of persistent study aided by a thorough acquaintance with the wants, and with even the minutest detail that could be made subservient.

All the fire alarm boxes in this city are connected by wires with the headquarters of the fire department, and are all numbered. When the hook in a box is turned down, the alarm is made only at the headquarters, where the operator, by the aid of a switch board, instantly sends the number of that particular box to every fire company in the city. In each company's house, near the door, are placed the gongs, recording apparatus, telephone, etc. (The position of the various instruments, the location of the engine and stalls, and of the poles by which the men descend from the upper floors, and the method of hanging the harness so that it may be placed upon the horses in less than a second, are all plainly shown in our view of the interior of the quarters of Engine Company 33, on Great Jones Street.) The first alarm is sounded upon a small gong, familiarly known as the joker, and the first stroke sets in motion a train of mechanical movements which, though in operation but an instant, produce most strange results, and change a scene of quiet into one of startling activity and of absorbing interest to the stranger who chances to be present. The first impulse of electricity passing over the wires attracts the armature of a magnet, which releases a small weight sliding on a rod placed beside the gong. This weight strikes the arm of a lever that permits the fall of a heavy weight located below the floor, and which is so connected as to withdraw the bolts holding the halters of the horses, who dash forward to their places under the harness. The same impulse of electricity has sounded the alarm upon gongs in the sleeping apartment on the second floor and in the reading rooms on the third floor, and the men come sliding down the brass rods. The time of receiving the alarm is recorded by a small clock that is stopped at the first stroke. Before the gong has ceased ringing the harness has been dropped and clasped, the driver is belted to his seat, and the men are waiting for the doors to be rolled back.

So far each company in the department has gone through these operations, since all are compelled to hook up at every alarm. The boiler of the engine is directly connected with a coil of pipe in an ordinary egg-shaped stove placed in the basement. Low down upon the rear of the engine are two pipes which are attached by telescope joints to two pipes leading up from the coil. When the engine is to go out, two valves which prevent the escape of water from the boiler are closed by moving a lever, and a rod pressed down through a hole in the floor. This rod operates four valves; two which close the pipes leading through the floor, and two which open pipes leading to a small tank in the ceiling, in order that the coil may be supplied with water during the absence of the engine. The rod also raises the lid of the stove to deaden the fire.

The strokes upon the joker might be compared to a series of dots and dashes sounded quickly—thus, two strokes and a pause, three strokes and a pause, and five strokes would indicate that the alarm came from box numbered 235. These strokes are repeated two or three times by the joker, and are then told off, but much more deliberately, upon the large gong. This arrangement is to save time, and while the men are hitching up they are counting the strokes, and if there is any doubt about the number they wait until the signal is given by the big gong. But it generally happens that the engine is on its way to the fire before the second gong has begun its work. After the exact number has been ascertained, all those companies which are expected to respond to that number start for the scene of the fire, while the other companies, after waiting a short time, unhook the horses and place the apparatus in the condition it was before the alarm was struck. We thus see that one stroke places the entire force of the department on the alert, and fifty-four engine companies (nine of which are double companies, and are provided with an extra engine and a large number of men), seventeen hook and ladder companies, and the two water towers are ready to turn out at every alarm. Many of the companies are frequently out of their houses in three, four, or five seconds, and at the last horse show in Madison Square Garden, this city, Engine Company 33 hitched up once in 1¾ seconds, once in 1⅝ seconds, and once in 1¾ seconds—or three consecutive times in less than 2 seconds.

The most important item in the time question is getting the horses in harness. The horses are placed in stalls as near the pole as practicable, and are kept bridled. The harness is attached to the engine, and is raised to such a height that the horse has no difficulty in passing to his place beneath it. It is suspended from a Y-shaped frame of tubing, at each end of which is pivoted a downwardly curved hook, upon which the harness rests. The reins pass through a catch in the center of the frame, so that by pulling them the hooks are released and the harness allowed to fall upon the backs of the horses. The collars are hinged at the middle, and one free end is provided with a bolt which enters a socket in the other end, in which it is held by a spring catch. The hinge is made wide so as to prevent lateral movement and insure the entrance of the bolt when the ends are brought together.

The forward fire engine shown in the illustration is from the Clapp & Jones works, and is what is known as second-class. The plunger is 4⅞ inches in diameter, and the engines (double) are 8 by 7 inches. The boiler is 64 inches high, 35 inches in diameter, has 120 drop water pipe tubes and 40 smoke flues. It is capable of throwing three streams, two side ones 2⅛ inches, and a center one 3¼ inches in diameter. It is not necessary to notify the engineer of the amount of water required, since the quantity can be controlled by the man in charge of the nozzle. In the nozzle is a conical shaped plug that can be moved longitudinally by turning a screw collar, and by this means a stream can be obtained varying from the size of a pin to the full capacity of the pipe. In case the nozzle is reduced or is completely shut off, the engine is relieved of all liability to serious strain by the action of an automatic relief valve designed by Mr. Pallett, of Engine 24. This valve is placed beside the pump, to which it is connected at two points, one above and the other below the plunger. The connecting passage is interrupted by a valve held upon its seat by a spring in such a way that the pressure necessary to raise the valve can be regulated at will. When the full power of the engine is required the valve is screwed down, but for ordinary work it is set at about eighty pounds. As soon as the water pressure in the pipes is increased beyond this point, by partially closing the nozzle, the valve is lifted and communication made between the top and bottom of the pump chamber; when the nozzle is completely closed, the valve is raised clear of the passage, and the pump churns the water round and round. The engineer is relieved of all care, and the control of the water is placed in charge of the one who best knows the quantity required. The spray nozzle consists of a cylinder, one portion of which is thickly studded with small holes, and upon which slides a collar wide enough to cover the perforated section when a spray is not desired.

The sleeping quarters of the officers and men are on the second floor. Through the floor, in locations so as to be most quickly used, are three openings, in the center of each of which is a smooth brass rod leading to the floor below. Upon the third floor are the billiard room, lockers, drying room, which has a zinc floor, and, together with the bathroom, is heated by a furnace in the basement, and feed room. Hay and grain are raised from the rear. The grain bins are connected with the lower floor by tubes, and the hay is passed down through chutes, so all the dust is confined to one small room.

When fighting a fire, it sometimes becomes essential to throw a powerful stream into the upper stories of a building, and to give the most satisfactory results the nozzle should be elevated and brought in close proximity to the window. This is accomplished by the water tower (shown in several positions in the upper view), which consists of a large pipe so mounted upon trunnions that it can be quickly raised to a vertical position. The lower end of this pipe is connected by a flexible pipe that extends under and to the rear of the truck, where it terminates in four 3 inch inlets, each of which may be coupled to a hose leading from an engine. Each inlet is furnished with a swinging valve, operated by the pressure of water in the pipe. Various lengths of pipe can be screwed upon the upper end of the trunnion pipe, giving the following lengths: single, 29 feet, long single, 36 feet, two short lengths, 43 feet, two long, 50 feet. Between the end of the pipe and the end of the nozzle is inserted a short piece of flexible pipe that moves between two side flanges. Projecting from each side of the nozzle is a stud that enters a groove in the flange. The nozzle is connected by a light wire rope with a small drum placed on the body of the truck, from which location all the movements of the tower are guided. By winding up this rope the nozzle will be depressed and will deliver water in a downward direction. The short connecting pipe bends upon a curved frame that prevents wrinkling. The elasticity of the pipe and the force of the water are sufficient to raise the pipe when the rope is unwound. To stay a long length of pipe there is a stout wire rope extending from the top to a drum at the base. This rope is extended by braces hinged to the lengths. The vertical pipe may be moved upon its own axis. The stream may be delivered at any height below a certain limit, and may be directed up or down or to either side.

A distributer to be attached to the end of a hose consists of two curved hollow arms, one at each side of the closed end of the pipe. Upon the hub of each of these is a pinion engaging with a gear on the pipe. When water under great pressure is sent through these arms, they are rapidly revolved upon their own axes and at the same time about a common axis, so that they send a shower of water in all directions.

Water tower No. 2 is located in the same house with Hook and Ladder Company 3, on Thirteenth Street. Few people have any conception of the number of implements forming the equipment of a hook and ladder company, and fewer people still have any understanding of the uses of these tools. The truck here referred to carries the following tools, the use of which we briefly mention: Two Bangor extension ladders, one 65, the other 45 feet long, so constructed that they may be made any length up to the extreme; two ladders 35 feet long, one 33 feet, one 25, one 20, one 15, one 12, one hook 20 feet long, one 15, one 12, two 10, and six 6 feet long. Two Babcock fire extinguishers, used upon small fires when required. One battering ram weighing 64½ pounds, and formed with a thick wooden section terminating in an iron shoe at one end and having a short rod at the other; this is manned by six men; its use is apparent. Six tubular hand lamps. Four rubber buckets. Seven forcible entrance tools. The iron shutters and doors upon the buildings of this city, being secured upon the inside, are most serious obstacles placed in the way of firemen, who, in order to effect a quick entrance, are supplied with crowbars and jimmies made of the best steel and after the most approved pattern. One 10-pound steel maul. Four cotton hooks, four hay forks, and two shovels for the removal of loose material. Four axes for cutting through floors, roofs, and partitions, and two picks for entering walls. One crow bar, ten wrenches and belts, including a gas pipe wrench for shutting off the gas when necessary; one roof rope 125 feet long; two horse blankets; one whip. One respirator, by which the wearer is enabled to enter dense smoke and to encounter noxious vapors. One distributer, described above. One four way connection. One length 3½-inch combination hose. One copper pipe 3¼ inches. Three nozzles. One iron pipe holder. One calcium light with oxygen and hydrogen tanks and fittings. This is found most useful in lighting up the scene of operations. Two danger flags, to signal trains upon the elevated railroads, one patent horse shoe, one butting stick, one brass gong, two cushions. One cellar pipe, 1⅜-inch nozzle, which is used to direct a stream to any part of a cellar, up or down, when thrust through a lower window, and which is of the utmost advantage in situations where the ordinary nozzle could only be made to deliver a downward stream. One cross bar and chain. Three scaling ladders of the following lengths and weights: 16 feet 35 pounds, 18 feet 39 pounds, and 14 feet 27 pounds. These are wooden poles backed with a strip of iron and having steps at about every fourteen inches. To the upper end is secured a right angled arm which is notched upon the under side and which ends in an angle piece. The hooks so formed are long enough to extend to the inner side of the widest window sills. The ladder is raised and the hook thrust through the window when the fireman ascends. Another ladder may be handed to him and by him hooked in the second window, and another in the third window, until a string of ladders reaches the roof, or he may support himself upon the sill, raise the ladder he came up by to the second window, and so on to the roof. One life line 150 feet long and three coils of life saving rope. The total weight of the tools is 2,718 pounds, and these together with the twelve men who go with the truck, and the truck itself, weigh 9,756 pounds.

Welding Fluxes.

We do not know that the following welding fluxes are any better than the welding material used generally by watch makers and silversmith, but they have been patented in England, so we publish them.

1. A welding material composed of 25 parts by weight of borax, a paper or metallic support, and 60 parts of metallic filings of the same nature as the metals to be welded, and made by first melting the borax; second, immersing the support in the fused borax; third, smoothing the same by passing it through pressure rollers; fourth, sprinkling its two faces with the metal filings; fifth, heating the sheet in an oven; sixth, passing through pressure rollers.

2. A welding material composed of borax and of metallic filings of the same nature as the metals to be welded, mixed with the fused borax, and in the proportions substantially as set forth, and then rolled out into sheets of about one sixteenth of an inch thick.

3. The welding sheets coated with a layer of gum lac or other appropriate varnish.

The following compound has been frequently offered as a trade secret: Take copperas, 2 oz.; saltpeter, 1 oz.; common salt, 6 oz.; black oxide of manganese, 1 oz.; prussiate of potash, 1 oz. Pulverize these ingredients and mix with them 3 lb. of nice welding sand.

A Lucky Inventor.

The *Milling World* says that George Westinghouse, before he invented and perfected his well known air brake, was regarded by a number of his then acquaintances with something approaching pity, because of his alleged lack of "gumption." His air brake was a success, and his friends began to think there was something in him after all. His automatic engine added to his fame and bank balance, and he mounted higher in the esteem of his former friends. A few weeks ago a valuable well of natural gas was struck on his premises at Homewood, near Pittsburg. The well is 1,580 feet deep, and the flow of gas is tremendous, the roar being almost deafening and scarcely endurable to the citizens of the neighborhood. Two other wells are being put down by Mr. Westinghouse, and he estimates that his profit therefrom will soon amount to $1,000 a day. We don't know what he wants of those wells, as he is not in straitened circumstances, but if some of those former friends, adds the *World*, don't just about bow down and worship him ere long, we'll miss our guess.

The Panama Canal.

The London *Graphic*, of July 19, thus comments on this great engineering enterprise: If ever this channel of communication is completed, it will have, like the Suez waterway, far reaching consequences. The British public, however, do not show much interest in the affair, and therefore seekers after trustworthy information are driven to the official reports recently issued by the Government of the United States. From these documents we learn that, though the canal itself is scarcely begun, much useful preliminary work has been accomplished. Surveys have been made, the route has been cleared of trees and bushes, cottages and barracks have been built, and hospitals established. Admiral Cooper states that the undertaking is so gigantic that it is difficult to believe that it can be finished by the allotted time, 1888, but he admits that the work already done is of a solid and substantial character.

Recently there have been serious disturbances both at Panama and Aspinwall, chiefly between the native Colombians and the imported laborers, some 12,000 or 14,000 in number, from Jamaica. As these latter are, of course, British subjects, it is quite possible that our Government may be drawn into some difficulty. Finally comes the question whether the canal, if finished, will prove a commercial success. It is reckoned to cost 120,000,000 dollars, and will probably cost a great deal more. Will the tolls which are levied on the ships which pass through be likely to yield a fair interest upon this enormous capital? That the Suez Canal was at first a failure and is now a success does not answer the question, because the circumstances of the two cases are not analogous. There is no region in the Western world to which the Panama Canal will be such a convenient short cut as the Suez Canal is to the countries of Southern Asia. To Australia the Panama Canal will merely afford an alternative route of doubtful advantage; neither Mexico nor Peru raises much produce as compared with India or China; and the western coast of North America is already united with the eastern by several lines of railway. Altogether, the Panama Canal seems more likely to be useful to America than to the world in general.

Removing Phosphorus from Iron.

Andrew Carnegie, one of Pittsburg's most extensive iron masters, gives the following description, in the *Collier's Guardian*, of how Messrs. Thomas and Gilchrist succeeded in devising their now famous process for eliminating phosphorus from iron. This writer says: "In making steel, ten tons of molten pig iron are run into a big pot called a converter, and hundreds of jets of it are blown up through the mass to burn out the silica and carbon, and finally to make it steel.

"Now, phosphorus has a greater affinity for lime than for iron, when it reaches a certain temperature; and when the air blast brings the mass to the required heat, the million particles of phosphorus, like so many tiny ants disturbed, run hither and thither quite ready to leave the iron for the lime. In experimenting to get rid of the phosphorus, these clever young men (Thomas and Gilchrist) first put a lot of lime in the bottom of the pot as a bait, and into this fly the ants, perfectly delighted with their new home. The lime and the slag float to the top and are drawn off, but mark you, let the temperature fall, and the new home gets too cold to suit these salamanders, although the temperature may be over 2,000 degrees, hot enough to melt a bar of steel in a moment if thrown into the pot. No, they must have 2,500 degrees in the lime, or they will rush back to the metal. But here lay a difficulty, 2,500 degrees is so very hot that no ordinary pot lining will stand it, and of course the pot itself will not stand a moment.

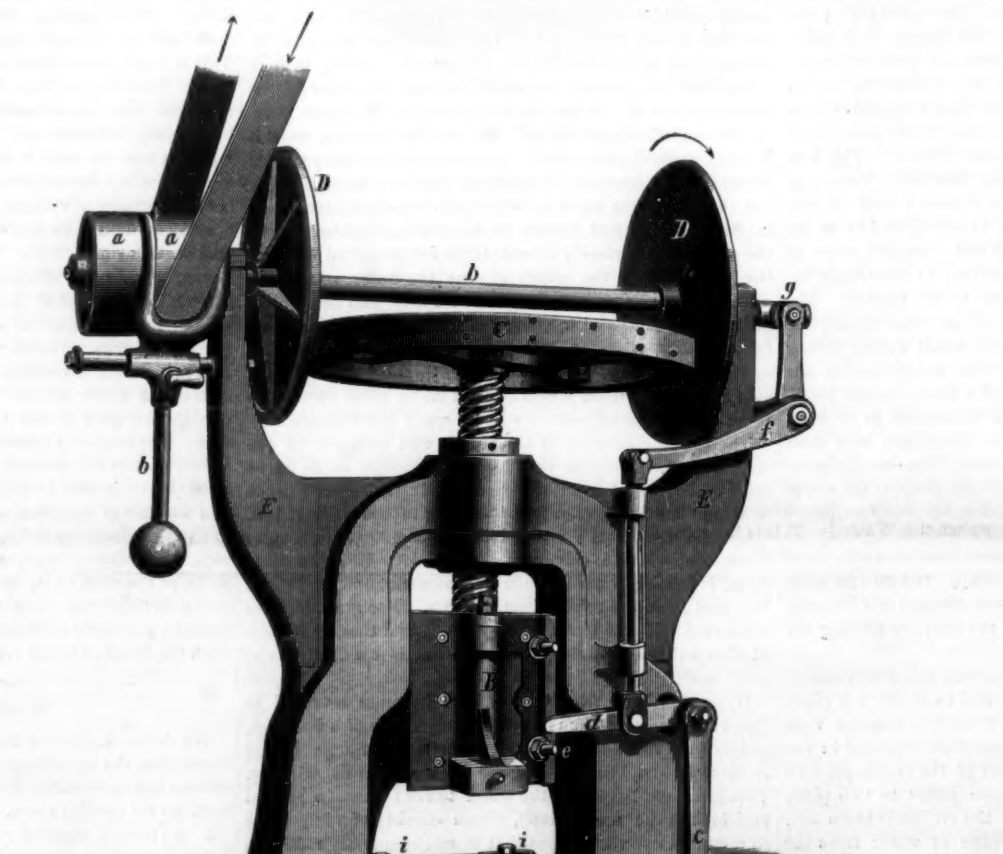
"If genister or fire brick is used, it just crumbles away, and besides this, the plaguy particles of phosphorus will rush into it and tear it all to pieces. The great point is to get a basic lining—that is, one free from silica. This has at last been accomplished, and now the basic process is destined to revolutionize the manufacture of steel, for out of the poorest ores, and even out of the puddle cinder, steel or iron much finer than any now made for rails or bridges can be obtained, and the two young chemists, patentees of the Thomas-Gilchrist success, take their rank in the domain of metallurgy with Cort, Neilson, Bessemer, and Siemens."

Cement for Connecting Glass and Brass.

According to Puscher (*Chemiker Zeitung*), a cement of the kind which stands heat very well and which is not dissolved by petroleum, and is therefore very adaptable for cementing the brass burners on the glass reservoirs of petroleum lamps, is made by boiling 1 part of caustic soda and 3 parts of colophony with 5 parts of water, and kneading up the resin soap thus formed with half its weight of gypsum. Thus prepared, the cement hardens within about three-quarters of an hour. If zinc white or white lead is used in the place of gypsum, the hardening takes place more slowly.

IMPROVED FRICTION SCREW PRESS.

Our illustration, taken from the *Deutsche Industrie Zeitung*, represents a screw press with a flywheel attached, which offers a good substitute for a drop hammer, where certain operations forbid the use of the latter. Power is applied at the pulleys, *a*, which set the friction disks, D D, in rotation. By turning the lever, *c*, to the right or left, either one these disks can be pressed against the rim of the flywheel, C, which is covered with leather. In this manner the head block, B, can be raised and brought down quickly and with a power depending upon the speed and size of machine. The stops, *e*, on the head block disengage the friction disk, D, at the proper moment and thus prevent any undue strain which might otherwise occur. The lever, *c*, may be extended below the floor and worked by a treadle, thus leaving both hands free.



IMPROVED FRICTION SCREW PRESS.

COMMENTING on the cholera, which is prevailing to a considerable extent in the south of France, *Nature* says: "Of the future course of the epidemic it is at this stage almost impossible to speak with any authority; but it is very certain that occasional lulls in the number of attacks—occurrences which are immediately reported as indicating a subsidence in the outbreak—cannot be regarded as having much significance in this respect; for it is one of the essential characteristics of cholera, especially in the early stage of an epidemic, to exhibit periodic fluctuations both in the number and in the intensity of attacks."

Henocque's Collodiographic Process.

The applications of ricinated collodion—that is to say, of normal collodion rendered elastic by the addition of a small quantity of castor oil—have up to the present time been reserved for therapeutics; but Dr. Henocque utilizes this product for a very different purpose—that of fixing or transferring and reproducing the delicate imprints of those stylographic tracings whose use is constant in physiological, physical, and meteorological researches, and, in general, in the numerous applications of the graphic method. These tracings are formed by an extremely light stylet upon smoked paper, which is wound around a cylinder or drum that has a continuous or interrupted motion. The stylet, in removing a part of the lampblack, leaves fine white lines, which stand out from the black background and are fixed by means of varnish, so that they may be preserved and reproduced by engraving or typography.

In the process under consideration, the lines are covered with a coat of ricinated collodion, the ether is allowed to evaporate, and the collodion forms a pellicle which contains the lampblack and imprints of the stylet. There is thus obtained a sort of pellicular negative that exhibits transparent lines upon a black ground. This pellicle is separated from the paper by means of water and transferred to a glass plate, to which it adheres upon drying.

This negative may be at once used as a lantern slide for projecting the enlarged image of the tracing upon a screen; or it may be used for reproducing the tracings by the Marion and Pellet process, or the lines may be reproduced upon sensitized paper. In the latter case the lines will be black upon a white background. To obtain the lines in white it will be necessary to convert the collodiographic negative into a photographic one. These operations, thanks to the gelatinobromide process, can be effected by the light of a candle. Finally, the collodiographic negative can be converted into a typographic plate by the Gillot process. This process, which will certainly be improved, already offers a very simple autographic method. It not only permits of the rapid manufacture of pictures for projection, but the author has, moreover, used it for reproducing India ink and crayon drawings that had been made upon drawing paper, or upon paper of the most ordinary kind.—*La Nature.*

Electric Light Patents.

Judge Shipman has just filed his decision in a very important patent suit brought by the Brush Electric Company against users of the Weston electric light apparatus. The defense has been conducted by the United States Electric Lighting Company, manufacturers of the apparatus, and the trial has occupied nearly four years. The testimony taken covers over two thousand printed pages, and the oral argument before Judge Shipman in March last occupied eight entire days. The suit was upon the two principal patents granted to Charles F. Brush, one for metal plated carbon points, and the other for an electric arc lamp, which, it was claimed, controlled the entire business of electric arc lighting. Before the argument the plaintiffs withdrew the carbon patent, and Judge Shipman now decides that the lamp patent is invalid and void and dismisses the bill, with costs, as to both patents.

Connected Twins.

A most wonderful freak of nature recently occurred in the practice of Dr. J. Q. A. French, of Hillsboro, N. H., in the birth of twin girls, united from armpit to hip by a bone serving as breast bone for the two. Otherwise they were fully and perfectly developed, each having a spinal column, from which the ribs extended to an attachment at the one sternum between them; arms, hands, feet, and legs in every way perfect, and no unpleasant feature about them. Life was extinct before they were *both* born, although *one* breathed for several minutes. The mother, Mrs. Thompson, is slowly recovering. The weight of the strangely united couplet was thirteen pounds, and they are preserved for the benefit of those interested in medical science.

THE NEW STERN-WHEEL GUNBOATS OF THE FRENCH NAVY.

Our engraving gives a general view of one of the new stern-wheel gunboats that the Minister of the Navy and Colonies has lately had built for service on the rivers Tonkin and Gaboon. These vessels, five in number, were constructed by the Societe des Anciens Etablissements Claparede. They bear the names of Henry Riviera, Carreau, Garnier, Berthe de Villers, and Pionnier. As they are designed to run upon Chinese and African rivers, whose waters are often very low, their maximum draught is 0·70 m., and their minimum speed is 9 knots. They are provided with a 250 H. P. motor.

Each vessel consists of a flat-bottomed float of Bessemer or Siemens-Martin steel, of the first quality, thoroughly zincked. It is provided with three false keels, and the deck is surrounded with a rail. Upon the deck, and under a roofing, are established cabins for the commander and crew. Above the roofing there is a platform arranged in such a way as to receive all the vessel's armament. This latter consists of two 90 mm. guns, one fore and one aft, and four Hotchkiss revolving guns. There are six places provided on the platform for three of these revolving guns, the fourth being stationed at the top of a hollow steel mast located amidship.

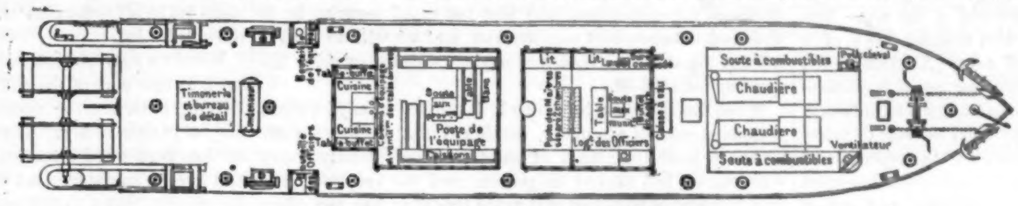


Fig. 2.—PLAN OF THE VESSEL.

The interior of the float is divided into twenty-eight compartments that contain the various storerooms and magazines, as shown in the plan in Fig. 2.

The length of each vessel between perpendiculars at the load water line is 37·2 meters; the width amidship is 7·4 meters; and the depth is 1·3 meters.

The engine, which is of the compound type, is a surface condensing one, without expansion apparatus. It has two horizontal cylinders and direct connecting rods, and develops, at a minimum, a 250 indicated horse power, at a velocity of 55 revolutions per minute. Four of these gunboats are designed for the Tonkin and one for the Gaboon.—*La Nature*.

Millions of Dollars in the Treasury Await Owners.

A curious fact shown by the United States Treasury's balance sheet at the close of the year's business is that there is nearly $20,000,000 of outstanding government securities on which the money is due and uncalled for, writes the Washington correspondent of the Louisville *Commercial*. On all of these interest has been closed, and there can be no possible reasons for the holders to delay presenting them for redemption. Some of them have been due for many years. On some of them there are due large sums of interest, which have not been called for, so that the interest on these alone amounts to $347,000. What has become of these documents and why they are not presented is something no one can find out. Some of them matured a half a century ago, and are still unheard from and unpresented.

Of the old debt, which matured prior to January 1, 1837, there is still outstanding $57,665 of principal, and $64,174 of interest. Of the Texan indemnity stock, which matured 20 years ago, there is $20,000 yet outstanding not presented. Of the 5-20s of '62, which matured more than 10 years ago, and on which interest ceased at that time, there is still outstanding $355,250. Of the 10-40s of '64, which matured 5 years ago, there is yet unpresented $178,850, with interest of $15,460 also due and unpaid. Of the 6 per cent consols, which matured 2 years earlier, there was $276,600 yet unpresented, and of the 6 per cent consols matured in 1879 there is over half a million dollars yet uncalled for, with interest matured, $56,990.

Of the 5 per cents, which matured in 1881–82, there is still nearly $800,000 unpresented, though the interest ceased at maturity. Of the compound interest notes of 1864, which bear 6 per cent interest, and which matured in 1867 and '68, over $200,000 are still out and uncalled for, while of the 7-30s of the same year, which matured more than 15 years ago, $133,800 has never yet been called for, nor has some $20,000 of interest on them been demanded. What has become of these bonds, which represent so much money, is hard to understand.

Some of them have probably been destroyed, perhaps the majority of them, though it is proper to add that the bulk of the $19,000,000 due and unpresented is of that which has fallen due within the past year, and which will doubtless be presented when the well-fed and leisurely coupon clippers realize that there are no more coupons to be clipped upon them, or that, if so clipped, they will not be honored because of the fact that the bonds have been called. There are, however, large sums which have been due many years, and have not been paid simply because they have not been presented. Some of these have doubtless been lost by fire and flood, others laid away as permanent investments of some fund, or perhaps forgotten in some dusty safe or mouldy pigeonhole. Why or how it is that such large sums are still outstanding and liable to continue so, is not even within the comprehension of the most experienced Treasury official to answer.

A Wonderful Railroad.

The Leadville *Democrat* thus describes one of the wonderful railways that penetrate the mining regions of Colorado:

Much has been written about the construction of the mountain divisions of the Rio Grande; travelers have marveled at the 4 per cent grades and the 15 degree curvatures of the remarkable narrow-gauge railroad which penetrates the most rugged canyons and climbs the most lofty mountain ranges of the Rockies. But nobody has ever well described the wonderful little feeder of the Leadville division, which modestly leaves the main line in Brown's canyon and ascends the mountain gulches to the east with the steepest grades and the heaviest curves in the world that are overcome with the ordinary drive-wheel locomotive. Afar up in this range of mountains, seven miles away, and nearly 3,000 feet higher than the bed of the canyon, is the famous Calumet mine, from which is extracted the hematite iron ore that keeps in blast the furnaces of the Bessemer works at Pueblo. Every morning of the year a ponderous locomotive and a small train of cars toils up this steep, and every afternoon they make the perilous descent to the valley loaded with iron, with steam brakes on the cars, the water pressure on the locomotive drivers, and a man standing at the brake wheel of each car.

This is the most wonderful piece of railroading in the universe. The maximum grade is 406 feet to the mile, or nearly 8 per cent., and the maximum curvature 25 degrees. The terminal of the branch is half a mile higher than the commencement. Imagine then the difficulty in ascending with empty cars, and the danger of descending with loaded ones. Still, strange though it may seem, a locomotive cannot make the descent unless at least five cars are attached. The latter are essential to provide the resisting power for the steam brakes. The trip up is snailish, the return is rapid, in spite of the steam pressure, which cuts the car wheels into sparks that fly out in a constant stream from the brakes, in spite of the reversed action, in spite of the lavish use of the sand pipe, and in spite of the water brake on the locomotive drive wheels.

Some few years ago, when the operation of the line was commenced, runaway accidents were almost of daily occurrence. The seven miles were, within a brief period, strewn with the wrecks of cars and locomotives, and iron ore. The most discouraging results attended the persistent efforts to make the line serve the purpose for which it was constructed. Day after day control over the descending train would be lost; some defect would interfere with the working of the steam brake, and even with the brake in successful operation the train would take a crazy notion and go flying down the mountain sides, along the brinks of fearful precipices, through the rock-bound gullies, and around the acute curves, like a bolt of lightning. The train hands would leap for life, and then the locomotive and cars would be dashed into fragments. In all these accidents, however, says the *Democrat*, nobody was hurt. Thousands and thousand of dollars' worth of rolling stock is said to have been destroyed before a successful system of operation was established. Only very few of the higher officials of the Rio Grande realize how terrible was the experience of these rides, and it is told of two of them who once summoned up sufficient curiosity and courage to make the journey, they were so frightened that they hung on the steps of the caboose, expecting every moment to have to leap for life.

Finally extremely heavy locomotives were built, and a force of exceptionally brave train men were secured. The latter were instructed to cling to their post at every hazard, and to never flinch in the moment of danger. Not a serious accident has been recorded since. Starting from the mine every brake is manned, so that in case the steam should fail the train could be checked. While there have been several runaways, in two years there has not been a wreck. The sight of one of these trains descending is one of thrilling interest, the sparks from the car wheels cutting a pathway of light down the mountains, which can best be described as having the appearance of a molten stream of fire rushing down to the river bed of the canyon.

In Switzerland there are grades as steep as these of the Calumet branch, but they are equipped for operation with the cable and cog wheels.

A New Gas Light.

For the past three weeks the York departure platform at Euston Station has been lighted upon a novel principle—namely, with an incandescent gas light. This light was invented by Mr. Lewis some two years since, and was described by us at the time, but the present is its first public application on a commercial scale. Before, however, it was applied at Euston the system underwent careful trial at the company's works at Crewe, and if it answers expectation at Euston—which so far it has—it will no doubt be widely adopted by the London and Northwestern Company. The principle of the burner is the mixing of air under pressure with common gas, the light being produced by the incandescence of a platinum wire gauze cap which forms the apex of the burner. The air and gas are mingled at the burner in such proportions that perfect combustion takes place, so that it is impossible for any unconsumed carbon to escape. The power used at Euston for compressing the air is simply that of a Bisschop gas engine of two-man power, which is sufficient to supply the air to a much greater number of burners than are at present in use there. The platform is 900 feet long, and it is very effectively lighted by 20 Lewis burners, which have taken the place of 50 ordinary burners previously in use.

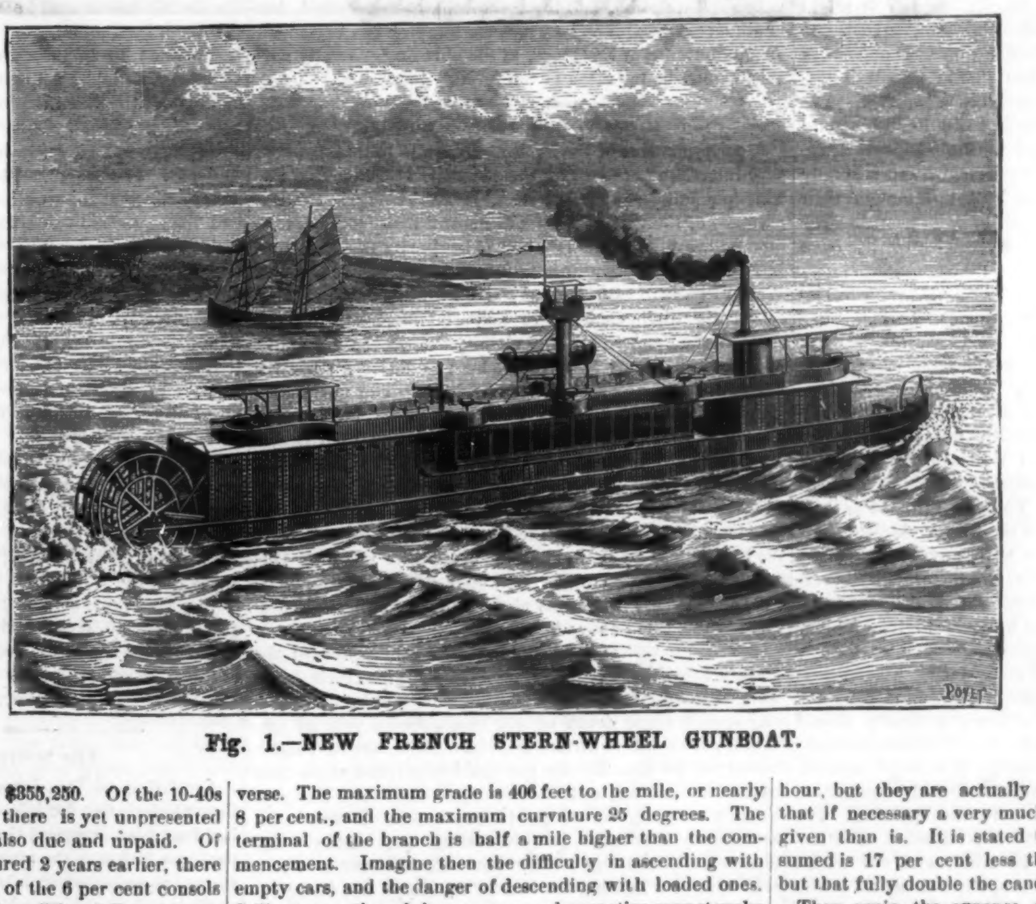


Fig. 1.—NEW FRENCH STERN-WHEEL GUNBOAT.

No lanterns or glasses are used, and the light is perfectly steady, there being no flame. It is, moreover, quite unaffected by wind or rain. The burners are constructed to consume 18 feet of gas per hour, but they are actually consuming only 12½ feet, so that if necessary a very much more brilliant light could be given than is. It is stated that the quantity of gas consumed is 17 per cent less than with the ordinary system, but that fully double the candle power is obtained.

Then again, the expense of the glass lanterns is obviated, as well as the labor of keeping them in order. An arrangement of this system has also been perfected for house lighting which gives the same results without the necessity of using power to compress the air. On the whole, the invention appears to be a practical success, and in view of its value as avoiding the formation of noxious vapors by combustion, and not less of its apparent economy, it would seem to have a good future before it, now that it has been practically started.—*London Times.*

HAY water is a great sweetener of tin, wooden, and iron ware. In Irish dairies everything used for milk is scalded with hay water. Boil a handful of sweet hay in water and put in the vessel when hot.

Cholera.*

We have at our command, if we are diligent in using them, the means of rendering cholera comparatively a harmless disease. What are these means? Manifestly all such as tend to produce a perfectly pure state of the atmosphere which surrounds us. In an atmosphere divested of impurities, imparted to it by the presence of man, cholera, cheated of its victims, will soon be compelled to look for some other abiding place. Where men are congregated in large numbers, during indefinite periods of time and under circumstances not favorable to cleanliness, we find all the hot-beds of the disease. Death from cholera is of very rare occurrence in the country, while the densely populated and filthy districts of large cities are oftentimes decimated. If, then, we are to have immunity from a disastrous epidemic, it can only be procured by a thorough cleansing of all our cities and towns. Not the ordinary cleansing, by sweeping the streets and washing out the great sewers, but *a cleansing which shall extend to every man's premises, on every street and alley, in the heart as well as in the suburbs of the city.* The demands of health will be satisfied with nothing short of a complete and thorough cleansing of every Augean stable. *This work cannot be commenced too soon, nor can it be continued too long,* or prosecuted with too much energy and industry. Should it be neglected in any locality until too late to prove effectual, let no physician subject himself to the reproach of having neglected to point out and urge its importance upon the public authorities. Let us urge it *in season and out of season*, and if death must come in the shape of aggravated cholera, we can at least meet it with the consciousness of having discharged our duty.

The best means for purifying the atmosphere must be familiar to all, and do not require repetition. The removal of all filth, and every source of filth, and the subsequent free use of disinfectants, are plainly indicated.

There can be no doubt that by strict attention to the general laws relating to health, many persons may pass through the worst epidemic without an attack of the disease who, by neglecting such precautions, would equally suffer with others. The object of each individual should be to preserve himself in the best possible state of general health. For this purpose, it is not necessary or proper that he should make any great change from his ordinary habits of life. All those causes which are known to make extraordinary draughts on the nerve-centers of organic life should be carefully avoided, while all means adapted to impart increased vigor to those centers should be equally cultivated.

Such attention to personal cleanliness is as much a necessity, with individuals, as purification of the atmosphere is with communities. Bathing, of whatever kind, if an habitual practice, should not be discontinued, though it might not be safe for any one unaccustomed to such luxuries to astonish himself with a cold or shower bath as a preventive of cholera. All confirmed habits should be continued, though they may be often moderated with advantage. The continuance of wine to those accustomed to its use should always be recommended. Old topers who suddenly leave off their drams are almost invariably attacked, and generally die. Their usual habits should be kept up, though their ordinary allowance ought, in no case, to be exceeded. The strictly temperate will derive no increased immunity from a resort to stimulants of any kind.

Nostrums and medicines of all kinds, unless prescribed by a judicious physician, should be carefully avoided.

In former epidemics, particularly the first, much harm was done by a rigid system of abstemiousness, amounting, in some cases, almost to starvation. Wholesome, nutritious food, in sufficient quantities and at regular intervals, is essential to the maintenance of a healthy organic sensibility. All excesses or all articles of food which, under ordinary circumstances, are known to produce even slight discomfort should be carefully avoided. Those accustomed to their use may eat ripe fruits, fresh from the tree or vine, in moderation, with impunity and even with advantage. Light meats, wholesome, fresh vegetables, and the ordinary beverages of milk, tea, and coffee are what the healthy appetite calls for, and nature will be found not only to tolerate but to profit by them. The clothing should be such as to preserve the uniform temperature of the surface. Flannel next the skin has been universally recommended, and there can be no doubt of its utility. The clothing generally should be accommodated to varying conditions of the temperature; all sudden transitions should be carefully guarded against, and the body, when heated by exercise, should be permitted to cool under some slight addition to the covering. The laws regulating the diffusion and concentration of atmospheric poisons should be borne in mind, and our advice given in accordance with them. As the sun gains power in the morning such poisons are gradually expanded and lifted into a higher regions of the atmosphere; so in the evening, as the sun goes down, and the shadows of night gather around us, they are rapidly concentrated near the surface of the earth. During this period of condensation is to be found the greatest danger of exposure; hence the morning, the late evening, and the early night air should be avoided. For the same reason, chambers should be selected on the second or third floor in preference to the first—cholera having always found a favorite abode in cellars and basements. During these hours the windows and doors of houses should be closed, even though it become necessary to open them at a later period. It has been recommended to wear a veil of some kind over the face, when persons are compelled to go out at unseasonable hours, and there can be no objection to the adoption of such a recommendation.

Fear, acting through the animal, makes heavy draughts on the organic sensibilities, hence tranquillity of mind furnishes an important safeguard against an attack of the disease. To secure this, persons should be advised to attend to their ordinary occupations, or encouraged to spend their time in administering to the wants of the sick. The sooner any individual rids his mind of the fear of contagion, the sooner he familiarizes himself with the presence of the disease, so much the sooner will he occupy a position of comparative security. Distance, as it "lends enchantment to the view," also increases the apparent magnitude of all dangers. One of the worst effects of a belief in the doctrine of contagion is, that while it gives no protection to the individual it deprives the sick of ordinary offices of humanity. Humanity in all its beneficent warmth often shrinks from a visit to the bedside of contagion. Once satisfy the mind that the disease is not contagious, and that increased security is to be found in benevolent ministration, and we will no longer witness the shocking scenes of neglect which disgraced the epidemic of 1832-33.

When the epidemic influence is developed in any locality, persons should be especially cautioned not to leave their houses in search of places of safety. They already carry with them a full load of the poison, and the exertion incident to hasty preparation and rapid traveling has the effect of impairing their powers of resistance. A large proportion of those who left Wheeling, after the epidemic was fully pronounced, were attacked with the disease before reaching their destination. Under such circumstances, home is the place of greatest safety.

One paramount duty of every physician, both before and during an epidemic, is to impress upon all who depend upon him for advice the *vital fact that diarrhœa, in whatever form it commences, is the first stage of cholera*, and the sooner it changes to the characteristic rice water appearance, the more speedy is the descent to the last and fatal stages. From ignorance or willful disregard of this fact, thousands and tens of thousands of lives have been sacrificed. He who neglects this symptom fails to put an extinguisher on the burning train which conducts to the explosive mine on which he stands. It is asserted by some writers, that cases occur in which the violent symptoms of the second stage set in without a precedent diarrhœa. Without denying the truth of these statements, I must be permitted to say that no such case fell under my observation, or under the observation of those physicians with whom I was immediately associated in practice. In some cases it was certainly of very short duration, and in others it was at first denied, but in all, on close inquiry, its existence was clearly ascertained. The importance of this stage, as the only one generally curable, cannot be too often or too forcibly inculcated.

*By Dr. M. H. Houston, published in 1866. Atlantic Journal of Medicine.

Nature's Wonderful Gas Works.*

A correspondent of the N. Y. *Sun* sends to that paper a very interesting account of the gas wells at Pittsburg, Pa. This community, says the writer, is awakening to the importance of the vast reservoirs of natural hydrocarbon gases now known to exist under a belt of territory extending from Lake Ontario southwesterly to this city, and thence through West Virginia to east Kentucky and Tennessee. Gas is now frequently discovered where there is no sign of oil. In some of the gas wells in this vicinity the gas is almost pure hydrogen, perfectly free from odor; in others further removed it has a strong scent of petroleum. The gas shows little variation in its heat producing power, but varies greatly in gravity, being comparatively heavy as it comes from gas wells in the petroleum regions, and lighter than air elsewhere.

The first recorded discovery of natural gas was made at Pittsburg between 1830 and 1840, when in drilling a well on the bank of the Ohio River, almost opposite old Fort Duquesne, a heavy vein of gas was opened. About the same time another gas well was struck under similar circumstances nine miles above Pittsburg. No attempt was made at the time to utilize the gas. In 1860-65 the people of the pottery town of East Liverpool, O., thinking their lands were on the oil belt, sunk a considerable number of wells, and at an average depth of 450 feet tapped a vein of gas, which put an end to further drilling. Some shrewd Yankee conceived the idea that the gas could be utilized as an illuminant and as fuel, and here was put down the first pipe line for carrying natural gas to consumers. It was not a satisfactory illuminant, however, being very smoky. The charge for its use was merely nominal, however, and it is still in use for lighting the streets, the lamps not being extinguished for months at a time.

Gas was first used as a fuel in the oil regions in 1862, in the Dunkard district, near the West Virginia line. William Rogerson, while developing petroleum territory, struck a vein of gas. He tried an experiment with it as fuel for his steam engine, and burned it with satisfactory results.

The first use of natural gas in the manufacture of iron was made at the Siberian Iron Works at Leechburg, Pa., in 1874. Mr. William Rodgers, one of the proprietors, conducted the gas to the furnaces by means of pipes, and found that the quantity of the iron produced was greatly superior to that made with coal. These works are still operated with natural gas, and the saving in fuel bills, as compared with the cost of coal, is $15,000 to $20,000 per year.

Since the laying of pipe lines to the city from the wells at Murrysville, Westmoreland County, and those in Washington County, natural gas has been in use in a large number of iron, steel, and glass works here. At the plate glass works the saving in the cost of fuel is estimated at $30,000 to $50,000 per year. The company, however, own their own gas well, which makes a large difference in their favor. Pittsburg has for several years been surrounded by large gas wells, most of the product from which was allowed to go to waste. About two months ago George Westinghouse, Jr., the owner of the air brake patents, struck a big gas well on his residence property in the Twenty-first ward, the flow from which he estimates to be worth $500 per day. This, too, is going to waste while the city legislators are deliberating upon what rules to adopt in regard to piping the gas through the city streets to consumers. Meanwhile, Mr. Westinghouse is sinking three other wells on his place, and there are in all some eighteen gas wells under way within the city limits.

Within a year at least one hundred wells will have been sunk in that part of the city lying between the Homewood Driving Park and the Monongahela River. Many of these may of course be dry. The property of the district likely to be thus perforated is residence property, owned in small lots, and is very valuable. An experienced operator gives it as his opinion that a well is not worth the cost of drilling unless put down on a sufficiently large tract of land to insure permanency. The striking of a well on a small piece of ground at once induces the neighbors to drill on their property, and thus the supply, that flowing through one well would last for twenty or thirty years, is divided up among many, which necessarily must lose head or pressure within a short time. Outside of the city limits and all along the line of the belt, a great many wells are being drilled.

The piping of natural gas from any considerable distance is accompanied by many obstacles. The friction in the pipes creates a back pressure which reacts on the well, and in time works its destruction. Thus a fine well in Butler County, which supplied the Natural Gas Company, of Butler, was in a comparatively short time destroyed.

One thousand feet of gas is the equivalent in heat units of four bushels of bituminous coal, plus the cost of labor saved in handling the coal and firing and getting rid of the refuse remaining in the furnace. Its economy in domestic use remains to be demonstrated.

Negotiations are now in progress for the consolidation of the natural gas interests in one great corporation. Mr. Ford of the Pittsburg Plate Glass Company, which paid $50,000 for the McGuigan well in Washington County, has within a few days been solicited to go into such a combination, which is intended to include Mr. Westinghouse, the Penn Fuel Company, and the Fuel Gas Company. Should this be consummated, the manufacturers can bid farewell to the prospects of cheap fuel.

Gas wells are 5⅝ in. inside diameter, and average 1,600 ft. in depth. It costs $3,000 to $6,000 to drill and case a well. The pressure at the mouth of the well varies from 40 pounds to 1,238 pounds to the square inch, and with this range furnishes sufficient carbon to take the place of 50 tons to 1,000 tons of coal daily. The duration of wells is not yet known.

Wells opened 24 years ago are yet flowing with undiminished pressure, and those which are apparently exhausted renew their full flow after being cleaned out. The combustion of natural gas is perfect. It burns with a pure rose color, and makes a tremendous heat. It is exceedingly penetrating, and this, combined with its odorless nature, renders it a dangerous agent. It is proposed to odorize it by passing it over a tank containing the refuse from coal tar or ammonia. It is so subtle that it will pass through paper or gold and silver leaf. It is destructive to animal life when inhaled for a short time.

The most generally accepted theory as to the origin of the gas is that the water from the earth's surface, penetrating to the inner fires, is decomposed into hydrogen, and this, gathering into large bodies, is freed by the drill and rushes to the surface. According to this theory, the supply can never be exhausted so long as the processes of nature continue as at present.

* The report, in part, of the committee appointed by the Western Pennsylvania Engineers' Society to investigate the properties of this natural gas may be found in the SCIENTIFIC AMERICAN of July 12.

The Source of Bile Acids.

According to Dr. Jensen (*Philadelphia Medical World*), Pettenkofer's test for bile also holds good for peptones. It had long been surmised that the slight bitterness of the true peptones is due to the presence of bile in one of its initial stages, as manufactured by the process of digestion. Experiments have been made on boiled albumen, flesh, and a solution of gelatine, after being converted into peptones in separate bottles by a minute proportion of Dr. Jensen's pepsin. The albumen peptone gave a much stronger reaction with the bile test than did the peptone from flesh; and the gelatine peptone was almost unaltered by the test. It is thus thought that the albumen of food furnishes the chief elements for the bile. And the natural inference of a layman would be—too much bile, too much albumen.

BOILED lettuce makes a good salad and furnishes an excellent substitute for spinach. It is said to possess soporific properties, and not to contain the quantity of oxalates to be found in spinach, rhubarb, sorrel, and some other vegetable products used for salads.

The Muskrat (*Fiber Zibethicus*).*

About two years ago Mr. Cristiani published an article extolling the fragrant properties of the "American musk," and saying at the conclusion that it can be substituted for the more expensive Russian or Tonquin musk. As the musk he alluded to is taken from the so-called muskrat or muskwash, which abounds in Canadian waters, and is very common in the numerous lakes and streams near which I reside, it seemed to me desirable that I should collect all the information I could obtain about the habits of this little animal, and about the properties and probable utility of the musk it produces.

In front of me as I write are the beautiful waters of Sturgeon Lake, stirred into life and motion by a strong southwest wind. The shore on which I have camped is low, but covered with hardwood to the water's edge. Sturdy oaks predominate, but not far off is a magnificent grove of maple. The lovers of fruit will also find in the neighborhood choke cherries, wild plums, gooseberries, raspberries, blackberries, and also a few whortleberries and cranberries. The opposite shore, about three miles off, is also low, dotted with farm houses and clearings, and having a stony beach covered with drift wood. Down this lovely water, some two hundred years ago, swept Count Champlain, leading a band of Indians to attack a settlement of their brethren of a different tribe, who lived on the shores of the lake which now bears his name. Into Sturgeon Lake run several small streams and rivers.

About forty years ago, for the purpose of navigation, and to give water power, a dam was built at the outlet, which, raising the water, had the effect of covering a great deal of low land on each side of the creeks and rivers. The trees were all killed by the excess of moisture, and their dead trunks and branches left standing give the place so weird a look that it has been named the "drowned land." This and kindred localities are favorite haunts of the muskrat, and here in some pool among the dead and decaying logs he builds his nest. It is two and sometimes three feet high, of a roundish, conical shape, something like an earthen bowl inverted, and is composed of pieces of stick, weeds, and dried leaves. The inside is commodious, and is warm, comfortable, and soft. There are two apertures, an entrance and an exit, and they are differently built. Both terminate under the water, so that the animal has to dive both in leaving and returning to his nest. The entrance is built as a gradual slope up to the floor of the lodge, so that he can easily run up it, but the exit is a precipitous descent down which he must jump into the water. In this nest he stays all day long, leaving it to search for food in the night or early gray of the morning. In summer he sometimes burrows the bank. Occasionally a rat more venturesome than his fellows may be seen swimming a stream in broad daylight, but this is not common.

The muskrat is amphibious, and spends a great deal of his time in the water, but commonly has only one method of leaving or returning to the bank. At the edge of the water are numerous fallen trees, the ends of which rest on the bank, and the other extremities under water. He chooses one of these as his pathway, swims to it, runs up to the bank, gets what he needs, and returns down the same log again. This habit is taken advantage of for his destruction. Some time in the early evening the trapper goes in his canoe with his ax and his traps, and, having discovered by marks best known to himself which log his prey has chosen, he cuts out a chip just below the water's edge, and in its place puts a trap, with two murderous steel jaws, but no teeth, for fear of injuring the fur. Over this trap the poor rat must go both in leaving or returning to the water, and he is thus nearly sure to step into it. These traps are visited night and morning.

The fur is the part of the animal desired, and the rest of the carcass is thrown away as a general rule, but is sometimes eaten. The hunter gets from eight to fifteen cents for each skin, according to the scarcity of the commodity or the demands of fashion, and many a fine sealskin set is in reality nothing but dyed muskrat. I said that the carcass was eaten occasionally. This occurs principally in winter, the flesh being out of season in the summer. I have myself eaten it in the latter part of September, but the dish was insipid. With the Indians, however, it forms a constant article of diet at their winter feasts. The musk sacs are placed in pairs, one on each side of the genital organs, and connected by a cord passing in front. They are underneath the external skin. All summer long and far into the fall the sacs are very small, but toward spring they increase in size, and about the months of February and March they attain their largest size and strongest odor. I have indeed been shown some, very small and useless, said to be the product of the female, but other trappers have contradicted this, and so the matter is doubtful.

About a year and a half ago, in the latter part of March, I obtained from a hunter half a dozen of the recent sacs. They ranged from three-quarters of an inch to two inches in length, by about an inch in breadth, were similar in shape to the well known sacs of beaver castor, but were of a light color, somewhat like the white meat of a chicken. They were filled apparently with an oily fluid, of a strong musky odor, but which had a putrid smell. Being very busy, I hung them in the sunny window of a wareroom to dry, where they were allowed to remain about two months, but though they filled the room with their musky odor, the putrid smell remained, and they never completely dried. At the end of that time they were cut up, and found still to contain an oily fluid, and much membrane, but nothing at all approaching in appearance to grain musk. The putrid smell never left them. Maceration in diluted alcohol extracted the odor, and a passable perfume was obtained. But the putrid taint still lingered, and I scarcely considered the experiment a success. Perhaps it would be possible, by a more careful method of drying, to avoid the odor of the decay, and if that can be managed, I think a very agreeable perfume can be extracted.

The little animal from which this product is obtained is not truly a rat, nor does it belong to the same family—*Muridæ*—but is more nearly allied to the beaver—Castor fiber—while the muskrat is Fiber zibethicus. It is much larger than the common rat, and its fur is reddish brown, and quite long. Its tail is round, but slightly flattened at the end, and it is said that he steers with it. Its two hind feet are webbed, and its front ones partially so. It lives on the roots and young bark of trees and shrubs, being very fond of the root of water lily. It is capable of being tamed. A friend some years ago had three or four running about the house like kittens, completely domesticated. Trappers describe them as a very clean animal.

There are three other animals also going by the name of muskrat, and which might possibly furnish a fragrant musk. These belong to the family of the Shrews, and have the upper lip elongated into the snout or short proboscis. Two species of the Mygale—one a native of the Pyrenees and the other of the south of Russia—and a third called the Sondeli, a native of India, which often utterly spoils provisions, through the persistency and strength of its odor.

Some portion of the foregoing is from personal observation, but a great deal from conversation with trappers. But as I have taken some pains in comparing different statements, I think I have not been deceived.

* By E. Gregory, in *Canadian Pharmaceutical Journal*.

Timely Advice about the Cholera by Florence Nightingale.

In view of the possible invasion of this country by the cholera during the present summer, the following letter by Miss Nightingale to the New York *Herald* will be read with interest. Her extensive practical experience in dealing with the disease gives peculiar value to her words of advice.

Sir: I beg to reply to your note asking for "practical advice in view of the rapid spread of cholera."

That our whole experience in India, where cholera is never wholly absent, tends to prove—nay, actually does prove—that cholera is not communicable from person to person.

That the disease cannot be ascribed to "somebody else," that is, that the sick do not manufacture a "special poison" which causes the disease.

That cholera is a local disease—an epidemic affecting localities, and there depending on pollution of earth, air, and water and buildings.

That the isolation of the sick cannot stop the disease, nor quarantine, nor cordons, nor the like. These, indeed, may tend fatally to aggravate the disease, directly and indirectly, by turning away our attention from the only measures which can stop it.

That the only preventive is to put the earth, air, and water and buildings into a healthy state by scavenging, limewashing, and every kind of sanitary work, and if cholera does come to move the people from the places where the disease has broken out and then to cleanse.

Persons about cholera patients do not "catch" the disease from the sick any more than cases of poisoning "infect" others. If a number of persons have been poisoned, say by arsenic put by mistake into food, it is because they have each swallowed the arsenic. It is not because they have taken "it," the "mysterious influence," of one another.

In looking sadly at Egypt—Egypt, where cholera did not begin anywhere along the route from India to Europe, but at Damietta, where no ship and no passenger ever stops, and where the dreadful insanitary condition of the place fully accounts for any outbreak of cholera—in sorrowfully looking at Egypt and at Europe now, one might almost say that it is this doctrine of a special poison emanating from the sick, and which it is thought can be carried in a package, that has (mentally) "poisoned" us. People will soon believe that you can take cholera by taking a railway ticket. They speak as if the only reason against enforcing quarantine were, not that it is an impossibility and an absurdity to stop disease in this way, but that is impossible to enforce quarantine. "If only we could," they say, "all would be well."

Vigorously enforce sanitary measures, but with judgment, *e. g.*, scavenge, scavenge, scavenge; wash, cleanse, and limewash; remove all putrid human refuse from privies and cesspits and cesspools and dust bins; look to stables and cowsheds and pigsties; look to common lodging houses and crowded places, dirty houses and yards. "Set your house in order" in all ways sanitary and hygienic, according to the conditions of the place, and "all will be well."

I beg to send you the best thing that has been written upon the subject—where also what can be said about quarantine is fully stated in the best manner—the lecture by Dr. Cunningham, Sanitary Commissioner with the government of India, on the "Sanitary Lessons of Indian Epidemics," at the beginning of the *Medical Times*, which I inclose.

The real danger to be feared is in blaming somebody else and not our own selves for such an epidemic visitation. As a matter of fact, if the disease attacks our neighbors we ourselves are already liable to it. To trust for protection to stopping intercourse would be just as rational as to try to sweep back an incoming flood instead of getting out of its way.

With the most earnest wish that America, as well as England, may "set her house in order," and so defy cholera and turn its appearance elsewhere into a blessing, pray believe me,

Ever her and your faithful servant,

FLORENCE NIGHTINGALE.

Facts worth Knowing around the Laundry.

That by adding two parts of cream of tartar to one part of oxalic acid ground fine and kept dry, in a bottle, you will find, by applying a little of the powder to rust stains while the article is wet, that the result is much quicker and better. Wash out in clear warm water to prevent injury to the goods.

That cold rain water and soap will take out machine grease, where other means would not be advisable on account of colors running, etc.

That turpentine in small quantities may be used in boiling white goods to a great advantage, as it improves the color, and the boiling drives off all odor. Resin in soap is quite another thing; it injures and discolors some goods, and shrinks woolens. Soap men argue that on account of the turpentine in the resin it assists in the washing. It is used for a filler and to make the soap hard and cheap. It is a fraud on the consumer.

That kerosene will soften leather belts or boots that have become hard from exposure or use around the wash room. Good for the harness when hard from rain or dampness. Wash with warm water, then grease with good animal oil or dressing like the following.

That the government harness dressing is as follows: One gallon of neatsfoot oil, two pounds of Bayberry tallow, two pounds beeswax, two pounds of beef tallow. Put the above in a pan over a moderate fire. When thoroughly dissolved add two quarts of castor oil, then while on the fire stir in one ounce of lampblack. Mix well and strain through a fine cloth to remove sediment, let cool, and you have as fine a dressing for harness or leather of any kind as can be had.

That baking soda gives instant relief to a burn or scald. Applied either dry or wet to the burned part *immediately*, the sense of relief is magical. It seems to withdraw the heat and with it the pain. Keep it in the ironing room.

That Javelle water, often met with in works or articles on cleaning and dyeing, is made of one gallon of water and four pounds of ordinary washing soda. Boil for five or ten minutes, then add one pound of chloride of lime. Let cool, and keep corked in a jug or tight vessel.

That when acid has been dropped on any article of clothing, liquid ammonia will kill the acid, and then by applying chloroform you will restore the color in most cases.

That "cyanide of potassium" will remove all indelible inks whose base is nitrate of silver. Being a deadly poison, it will be hard to get from the druggist in most cities. Turpentine or alcohol rubbed in hot removes the new inks, using soda and soap freely in hot water afterward.—*National Laundry Journal.*

The British Patent Office Report.

The first report of the Comptroller General of Patents, etc., under the new law has been issued. The most striking fact of the report is the record of the sudden pressure thrown upon the Patent Office during the first month of the year, when cheap patents became available. The applications during January numbered 2,499; whereas the previous average for the month was about 500. Not only was the number of applications increased fivefold, but the work on them was much heavier; for the provisional specifications were not merely pigeonholed, as formerly, but were all examined, and in many instances amendments were introduced at the suggestion or by the requirement of the examiners. During the four months covered by the report the total number of applications made was 7,060. The expectations of those who imagined that the new law would dispense with agents are not justified by the facts; for 72 per cent of the applications still pass through the hands of patent agents. The preparation for the publication of an illustrated official journal is progressing, but owing to a difficulty experienced by the officials in selecting from the inventors' drawings appropriate views for publication, and the opposition of the solicitors to furnishing special drawings on a reduced scale for the publication, the Patent Office has not yet commenced the publication of illustrations in the official journal, and thus the most interesting portion of our *Official Gazette* is omitted in the English publication.

M. Pasteur's Hydrophobia Experiments.

The experiments which M. Pasteur is reported thus far to have made are said to be an unbroken success. Fifty-seven dogs have been the subjects of investigation. Of these nineteen were rabid, and by these thirty-eight healthy animals were bitten under uniform conditions. Of the thirty-eight, one-half the number had been previously inoculated or "vaccinated" with attenuated virus; the other half had not. The latter, without a single exception, died with unequivocal signs of rabies, whereas the nineteen others remain as well as ever. They will be watched for a year by veterinary surgeons to see whether the inoculation holds good permanently or only temporarily. If rabies be not spontaneous in its origin, and if the experiments of Pasteur all turn out successful, there seems no reason why canine madness should not be extirpated from our midst.—*Lancet.*

Correspondence.

The Perfect Screw.

To the Editor of the Scientific American:

The writer of the article, "The Perfect Screw," in your issue of July 19th, evidently don't understand the subject referred to. The inventors of the system are Prof. Wm. A. Rogers and the undersigned, as will be seen by referring to our patent, issued July 1, 1884, No. 301,165.

We do not make any preliminary cuts to determine the errors of the leading screw. The errors are obtained by the aid of a microscope secured upon the tool carriage of the lathe, and a correctly graduated bar mounted in a convenient position upon the lathe bed, so that the movement of the carriage while being drawn along by the leading screw can be compared from point to point directly with the standard bar. The readings may be taken at any point desired, and thus the errors of the leading screw are readily obtained. When these errors are found and tabulated, then the operation of cutting is commenced. The error for the total length is taken out by an automatic movement which varies the speed of the leading screw as it is short or long. The intermediate errors are taken out by the aid of an independent movement of the tool carriage and an indicator.

We have invariably found all of the screws short of the standard length.

In regard to the grinding operation, the article in question might mislead. The grinding is not necessary, except where the greatest accuracy is required, and on very small micrometer screws, such as those used in astronomical works, etc., where a very smooth movement is requisite. The operation of grinding simply removes any little roughness left by the cutting tool. It is impossible to grind out an error which takes in several threads. Our process deals directly with single threads, and these must be cut.

Below is a list of errors from an average screw, three feet long. The readings were taken at every $\frac{1}{2}$ of an inch. One division $=\frac{1}{5000}$ of an inch:

6	−18	−41	−105
0	−20	−46	−109
−9	−13	−47	−107
−1	−17	−50	−112
−3	−8	−57	−112
−6	−10	−55	−114
−4	−16	−58	−117
−5	−14	−61	−118
−1	−21	−64	−122
−2	−18	−68	−122
−7	−22	−69	−124
−5	−24	−72	−127
−11	−24	−72	−127
−9	−26	−72	−127
−9	−24	−76	−129
−14	−25	−83	−130
−11	−29	−81	−132
−13	−27	−84	−130
−19	−29	−86	−133
−19	−30	−90	−135
−18	−34	−99	—
−17	−37	−94	5000
−20	−38	−98	
−22	−38	−102	

$=\frac{27}{1000}$ short in 3 feet.

Yours very truly,

GEO. F. BALLOU.

Hartford, Conn., July, 1884.

Manufacture of Relievo Maps.

The following ingenious method of making relievo maps is by J. J. De Mendonca Cortez, of Lisbon:

In maps which are drawn to scale it is usual to indicate the variations in the contour of the land by a series of continuous curves or lines, each representing a rise of say one hundred feet. In constructing relievo maps according to this invention, as many proofs of the map of the district to be modeled in relief are struck off on metal or paper from the stone or engraved plate as there are hypsometrical or height-indicating curves drawn on the map for the district in question. These proofs or maps are then laid out upon and suitably attached to perfectly smooth and level plates of metal, card, or other suitable material. The thickness of these plates is proportionate to the equidistance of the hypsometrical curves, and care must be taken in laying down the proofs if on paper not to stretch or contract them. The several plates are then laid upon a suitable table and carefully cut out by means of a fine band knife or saw or other suitable means, care being observed to follow exactly the lines of the hypsometrical curves, and a different height curve being cut around in each plate.

There will result from this operation a series of inner cuttings of different sizes and various contours, and also a series of corresponding outer or marginal cuttings. The inner cuttings are accurately laid the one upon the other in order of size, and fixed by means of glue, solder, or otherwise upon a perfectly level bed plate, by which means an exact and proportioned relievo is obtained of the map under treatment. It should be remarked that if paper proofs have been used it will be necessary, after adjusting but before fixing together the several cuttings or overlays, to detach the paper from the metal or other plates. To effect this detachment without injury to the plates, the latter may be washed in water, spirit, turpentine, or other suitable fluid. This model in relievo, or core, is then marked with several gauge points, by means of which the position of the map to be moulded in relief can be readily adjusted. The next step is to cover this core with a sheet of moistened paper of a thickness equal to that of the paper of the map to be moulded in relief, which thickness can be ascertained by a gauge indicating hundredths and thousandths.

Upon the core thus composed of the inner cuttings and covered with the moistened paper the outer or marginal cuttings are severally adjusted by means of the gauge points above referred to, and in such a way that the narrowest marginal cutting, or that plate which has the largest aperture, is applied next to the base plate; the next sized marginal cutting upon the narrowest; and so on up to the last marginal cutting, or that plate which has the smallest aperture corresponding in size and contour to the inner cutting indicating the highest level of the ground, and forming the top of the core. The cut-out plates being thus perfectly adjusted, two or more holes strictly vertical are made therein, outside the engraved district of the map, to facilitate adjustment; and the moistened paper is then withdrawn. By this means an exact model in relief, or core, and a complementary model in intaglio, or matrix, corresponding accurately thereto will be obtained, and will constitute a die suitable for moulding in relief a map on paper of the proper thickness.

The extent to which the paper of the map to be moulded in relief will bear stretching or distention having been well ascertained, the map is placed upon the core and its position adjusted by the gauge points above mentioned, and moistened as often as may be desired by any suitable means, such as a badger or camel hair brush. The marginal cuttings are then laid in succession over their corresponding sections in the core, and are accurately adjusted by means of the holes made in them, the paper of the map being drawn or pressed more or less as required to conform to the desired contour. The paper being again moistened, another marginal cutting is superposed on the preceding one, and so on to the last one; the strains or distortions of the paper being always gradually and proportionately corrected by the application of gentle pressure and moisture.

Finally, a perfectly level plate is laid upon the top, and the whole is subjected to pressure in a suitable press. The top plate and the marginal cuttings are then carefully removed one by one, beginning at the top, and the map moulded in steps in relievo is removed from the core, thoroughly dried, and then stiffened by strong shellac or other suitable varnish or medium. It is then mounted in a case in such a manner as will best protect it from injury. If a continuous or natural relievo map is desired, the plates must be cut with a bevel along the hypsometrical curves, and the marginal plates must be formed with overhanging bevels to correspond.

Climbing Plants in Trees.

These give an appearance of robust luxuriance and unrestrained vigor, reminding the spectator of those tropical and semi-tropical climes where nature, under the influence of perpetual heat and moisture, runs riot, producing oftentimes vegetable giants. Some of the most astonishing of these are the climbing plants that ascend the tallest trees of the forest in search of light and space where they can develop their foliage and flowers, traveling from tree to tree, and some throwing out roots in the air that reach to earth, there taking fresh roothold, and extending still further in their stem growth. Our plants, checked in their growth by frost and cold through half the year, cannot vie with these tropical inhabitants of the jungle and the forest, and our nearest approach to them is to be found in the larger forms of ivy, in Ampelopsis hederacea, in Wistaria sinesis, the vine, clematises, and Periploca græca. But the largest and strongest of our climbers, the one that approaches the nearest to these, is Aristolochia sipho. Smaller creepers we have in abundance, but our purpose is with the most rampant ones, good for ascending our biggest trees. When once this becomes established, it will grow fast enough.

It is no use to merely dig a hole at the treeroot and stick the plant in, expecting it will do well; but a good sized hole must be got out near the stem. There are no fibrous roots in that part to draw the goodness out of the soil you give, unless the tree is young, and in that case you had better plant no creeper; or better, a hole may be made some distance off, training the main shoot underground when it has got as thick as the thumb, in the mean time allowing it to grow attached to a stake for support. If merely assisted in its upward climb with a tie here and there, this plant will quickly reach the summit of a tree 50 feet high; it will not then strangle a tree like ivy with its clustering, thick growth, but will creep outward, if the tree is a solitary one, to the extremities of the limbs, letting fall slender shoots and festoons of handsome, broad, heart-shaped foliage, and in warm summers an abundance of its curious pitcher-like brown flowers. Ampelopsis hederacea sorts make a good creeper, the growth being rapid, and its autumn tints most gorgeous. This is not a self-clinging plant, and must, therefore, have assistance at first, although later the interlacing stems clasp the stem and branches of a tree, and will merely require that its leading shoots be led upward and outward.

A. tricuspidata or Veitchii is a very handsome kind, but is less suited to climb a tree than to drape a low fence, the pediment of a statue, or a vase, or to be allowed to cover a low stump or pillar, and having, contrary to the other kinds of ampelopsis, a clinging habit, it gets on without much assistance. Periploca græca is a most hardy, quick growing, deciduous creeper, growing to great lengths in one season; the foliage is deep green in color and lanceolate in form. This is fit for any place where a creeper is desirable; the flowers are inconspicuous, and purplish in color. The clematis, vine, ivies, honeysuckles, and wistarias are too well known to need description, although it may not be amiss to note that Clematis flammula is one of the very fastest growers, and has deliciously scented white flowers, which appear in immense bunches on old plants.

C. vitalba should also not be omitted—indigenous to our country, and found in our southern hedgerows, smothering other plants out of existence. The trumpet honeysuckles, Bignonia radicans, and some such roses as Boursault, Prairie Rambler, Ayrshire, and Jasmine are all good in positions where there is much light, as the beauty of all these few last consists more in their flowers than in the foliage, so that as simple climbers rampant and full of leaf those mentioned at the beginning of this article are the best for the purpose.—*Gardeners' Chronicle.*

American Engineering Models for a Japan University.

The Imperial University of Tokio, Japan, reorganized in 1860 as the successor of the old Imperial Observatory, founded in 1744, is evidently pushing forward in that full accord with the spirit of modern progress which the Japanese Government has shown in so many ways since the old exclusive barriers were broken down. A notable instance of this is found in a recent order for models, sent by the authorities of the Tokio University, to be built at the engineering school shop of Vanderbilt University at Nashville, Tenn. The order embraces the following:

A model of wrought iron highway truss bridge, 6 feet in length, to be built in brass; a small working compound steam engine, with expansion gear and reversible gear; a small working iron turbine waterwheel, with water governor and sluice gate; two differently constructed cast iron models of steam engine pistons with metallic packing rings; a working model of engine's slide valve and expansion valve, with adjustments and appliances for indicating the relative positions of piston and valves at any part of the stroke; a working model of a surface condenser for a compound engine; a working model of an improved pendulum governor for steam engine, with adjustment for regulation of throttle valve.

The order for the truss bridge was accompanied by working drawings in blue print, but the other pieces are to be designed as well as constructed at the Vanderbilt University. The work will be commenced at the school shops with the opening of the fall session, and will afford the best of practice for the engineering students, of whom the class is so large that it is proposed to make duplicates of the articles ordered, that one set may be kept.

Instruction at the Tokio University is in Japanese, except in the Schools of Law, Chemistry, Engineering, Polytechnics, and Mining, in which the instruction is in English. The School of Engineering is under the charge of Prof. J. A. L. Waddell, an American engineer.

Cement Pipes for Sewers.

Mr. C. E. Chandler, writing to *Engineering News*, says: A very large proportion of the pipe used for sewers and drains in Norwich during the past ten years has been cement pipe.

I have yet to receive positive evidence that any of it, when properly or even fairly laid, has failed either on account of weakness or inability to withstand the chemicals of the sewage.

The mortar used in making pipe here has been composed of 2 parts of either Newark and Rosendale, or Hoffman's, or Norton's Rosendale cement and 3 parts clean sand. The latter preferably of various degrees of fineness, from the very finest to the size of one's finger end, in such proportions that the finer fills all the chinks in the latter, as the cement finally coats each particle and fills all remaining spaces.

It has been the experience of the maker that a larger proportion of cement inclines the pipe to season crack, and that a smaller proportion makes weaker pipes, with more difficulty in removing the moulds.

It is important that the materials be thoroughly mixed dry, and that the mortar be well rammed in the moulds.

It is also important that the right amount of water be used. Every particle of cement and sand should be wet, but the mortar should be stiff enough so that the rammer should bring up solidly on it and press it firmly together instead of displacing it horizontally.

The cores are usually drawn almost immediately after the pipe is finished, and in good weather the cases removed in about half an hour. The pipe is kept under cover about two weeks, and then preferably put out into the sun and air and well wet every day. This wetting is particularly important.

A curious fact is that an old pipe will absorb less water and is heavier than a new one. Will some reader explain it?

The pipes are considered ready for ordinary use six weeks after they are put out.

They are sometimes used much greener, and may be so used safely if carefully handled and properly laid. When necessary to use them very green, Portland and Rosendale cement is used; one part of the former to two of the latter. A large proportion of Portland makes the mortar set slowly at first, making it difficult to remove the moulds.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Frederick W. Kuehl, of Milwaukee, Wis. The buffer and draw springs are, by this invention, made in a novel form, to prevent the breakages liable to occur when ordinary steel springs are used, the construction being much cheaper than the ordinary form, and giving all the elasticity necessary.

MECHANICAL INVENTIONS.

A nut lock has been patented by Mr. Frank F. Stevens, of Slater, Mo. The invention consists in a washer shaped to form a nut lock, it being radially corrugated on its two faces, parted at one side, and spiral shaped, so that neither the nut nor nut seat requires any notches or unusual roughness for this lock to engage them.

AGRICULTURAL INVENTIONS.

A sulky corn stalk cutter has been patented by Mr. Alexis F. Gillet, of Burlington Junction, Mo. The object of this invention is to facilitate the cutting of corn stalks in the field, and to prepare the ground for plowing, and the machine may be made narrow to cut a single row of stalks, or wider to cut two or three rows at a time.

A check wire tension for corn planters has been patented by Mr. Albert P. Baker, of Thawville, Ill. Combined with a sliding rod having a cross head upon its forward end and an eye at its rear end is a spiral spring, adjustable stop pins, and other novel features, to give a uniform tension to check wires, so the pull of the planters will not draw the buttons of the check wire out of place, and the planting will be done in accurate check row.

MISCELLANEOUS INVENTIONS.

A running gear for vehicles has been patented by Mr. John B. Howell, of Allentown, N. J. This invention covers a novel construction and arrangement of parts, intended to promote elasticity, strength, and durability, and better adapt vehicles for use on rough and rocky roads.

A washing machine has been patented by Mr. Adam R. Herbein, of Fleetwood, Pa. This invention covers principally peculiar means for connecting the stirrers or rubbers to the vertical shaft, so the connection may be loose and not rigid, and hence less liable to tear the clothes.

A ventilating and adjustable rain proof has been patented by Mr. Samuel T. Atkin, of Georgetown, Texas. It is formed of a conical tube held on the roof, in the upper end of which conical tube the upper end of the stove pipe is held, a hood being held on the upper end of the stove pipe.

A meat tenderer has been patented by Mr. Virgil S. Brock, of Osceola, Ark. A bracket standard carrying a horizontal shaft is secured on a base, the shaft having a crank handle, and carrying a series of circular toothed knives or cutters, whereby meat may be rendered more tender and juicy by the cutting and bruising of its fibers.

A tricycle has been patented by Mr. Oliver U. Guinand, of Kansas City, Mo. The invention covers improvements in the construction and arrangement of the frame and driving and steering gear, whereby it is designed to simplify and cheapen the cost of the machine, and at the same time improve its working qualities.

An improved door has been patented by Messrs. George E. Filer and Albert H. Neff, of Sheldon, Iowa. The object of this invention is to so construct a door that it may be used for a tight storm door, a glass panel door, or a screen or woven wire door, and it provides for detachable panels of wood, glass, or woven wire, with special forms of construction.

An ash sifter has been patented by Mr. William T. Adams, of Baltimore, Md. This invention relates to ash sifters inclosed within a case or box, to prevent dust from escaping, and is an improvement on a former patent issued to the same inventor, intended to better the form and increase the holding capacity within a given size of box space.

A tobacco pipe has been patented by Mr. John O. Kilroy, of Albany, N. Y. The stem has an internally screw threaded neck, on which are a saucer and bowl held in place by a hollow screw through the bottom of the bowl and saucer, and screwed into the threaded neck, so the bowl can be easily detached and replaced.

A child's carriage has been patented by Messrs. Uriah McClinchie and Jay F. Butler, of New York city. The body has side or wheel fenders with upright guards mounted on them and set out from the body, whereby a roomy interior is secured, with greater safety and convenience for the child, and the body generally is strengthened.

A carburetor has been patented by Mr. William C. Strong, of Readfield, Me. The air trap to the bell is of novel construction, to be opened self-actingly by the lifting of the bell; there is also a water jacketed arrangement of the gasoline vessel and carburetor in the main tank of the machine, with special contrivances for the inlet of air.

A combined ash sifter and coal box has been patented by Mr. Charles F. Goss, of Tappahannock, Va. The invention comprises an open top case, with a rocking sifter, an ash drawer supported by a hopper shaped partition, a coal chamber with inclined sides, an opening, and a hearth, with other novel features of construction and arrangement.

A weighing scale has been patented by Mr. Thomas H. Herndon, of West Point, Miss. This invention relates to weighing devices which register upon a scale the weight of any article placed on the scoop, and its object is to weigh accurately and quickly, and do away with movable weights, for which a novel construction and combination of parts is provided.

NEW BOOKS AND PUBLICATIONS.

HOW TO TELL THE AGE OF A HORSE. M. T. Richardson, 7 Warren Street, N. Y. Price 30 cents.

This is a very small pocket manual, but it gives all the information needed for determining the age of horses.

Eureka Wheat Cleaning Machinery. Howes & Ewell, Silver Creek, N. Y.

The Straight Line Engine Co., Syracuse, N. Y.

Whittier Machine Co., 90 Liberty St., N. Y. Elevators, Engines, and Boilers.

Handsomely illustrated catalogues from the above works have been received at the SCIENTIFIC AMERICAN office.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Name and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or mail, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter**, should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. F. P. asks: In an engine 12 inches diameter, 14 inches stroke, which will give the most power—to add one inch to stroke and take one from diameter, or add one to diameter and take one from stroke? A. You get the most power by adding one inch to the diameter and one inch less stroke.

(2) H. R. F. wants to know what chemical substance or compound will produce the greatest degree of cold. A. According to Ganot, the greatest artificial cold has been produced by a bath of bi-sulphide of carbon and liquid nitrous acid, viz. —140°C. 2. Also, if there is any process by which copper tools can be hardened and tempered? A. No; the so-called ancient copper tools were an alloy of copper and tin, about 4 ozs. tin to the pound.

(3) J. A. C. desires a receipt for making the composition used by printers and others, for fastening the sheets of letter heads, bills, and note heads in tablets or pads. A. The exact composition of the substance used is kept secret, but we believe it consists of glue and glycerine in proportions similar to roller composition, except that a less quantity of glue is used. The coloring matter is some soluble aniline dye.

(4) C. V. R. asks: Will an ordinary belt feedwater pump lift as well as force water, say from a well through a pipe 50 to 100 feet long? A. Yes, if the surface of the well is not more than 20 feet below the pump.

(5) C. M. E. asks the respective displacement of water in tons of the steamers Oregon and America. A. The displacement of the Oregon is 7,400 tons gross, and that of the America 6,500 tons gross. 2. Also the chief advantages of the compound engine over the ordinary high or low pressure marine engine? A. The principal advantages are less condensation in the cylinders and more uniform work on the crank pin and shaft.

(6) C. E. K., Jr.—How can I harden a piece of cast steel that is very soft? A. Good cast steel will harden by being plunged into cold water while red hot. If the steel is decarbonized steel it may be casehardened by heating red hot, covering it with powdered prussiate of potash, and plunging into cold water.

(7) P. J. D. asks: How can I harden steel runner castings for ice skates, the temper to extend along the edge from one-fourth to one-half an inch from the bottom? Experiments make them crack or spring. How can I blue the bottom of these skates? A. Heat and harden the entire iron if of cast steel; brighten and draw to color in red hot clamps. Straighten while still warm by pressure, by springing under and over bars, or by blows on the anvil. If the skates are to be blued, they will be only spring temper. "Skate runner castings" are cast iron cast in chills. "Steel runners" for skates are drop forged from steel.

(8) E. H. asks: Please tell how to temper steel screw gauges, both male and female, without altering the size. A. Heat in melted lead; harden in cold water or brine pickle; polish bright; draw to color (straw) in hot sand. If the steel is homogeneous, there will be no change in size.

(9) J. P. P.—The tensile strength of a cast steel bar is 140,000 pounds, wrought iron bar 50,000 pounds, malleable cast iron 25,000 pounds per square inch. Small steel castings can be annealed in the same manner as steel forgings by heating to a full red, covering with hot ashes, allowing 3 or 4 hours to cool. Your rule for determining pitch of rafters by laying off with a carpenter's square is good, and is in common use by framers of buildings.

(10) J. C. asks: If it takes 10 pounds of power to elevate a weight of straw 14 feet (on a thrashing machine), what power will it take to elevate it 28 feet in continuous elevation? A. If the straw is moving continuously with an apron, you will have about twice the weight to lift in carrying the straw twice the distance, and the friction of the additional apron. More than twice the power will be required.

(11) W. C. S. asks: Will a $1\frac{1}{4}$ inch pipe conduct off or allow the steam to escape generated in a 55 horse power boiler, said boiler to be worked to its capacity? A. Yes, if the pipe is but a few feet in length.

(12) Inquirer.—The sun rises and sets north of due east and west about 47° at your place and date.

(13) F. E. L. asks: What should be the dimensions of valve, ports, and bridges of an engine 3x$4\frac{1}{2}$ to run 350 revolutions per minute, also size of pipes? What power would it develop, and how large a boiler should I need? How large and heavy a flywheel would I need; throw of eccentric? A. Make your steam port $\frac{3}{8}$ inch by 2 inches; exhaust port $\frac{1}{4}$ inch by 2 inches; bridges $\frac{1}{4}$ to $\frac{3}{8}$ inch; $\frac{3}{4}$ steam pipe; 1 inch exhaust; at 50 pounds mean pressure will equal 3 horse power; will require a boiler of 40 square feet heating surface; an 18 inch wheel weighing 50 pounds. Throw of eccentric equal to width of steam port and bridge.

(14) J. H. says: I wish to jacket a steam engine cylinder. I originally intended to use plaster of Paris for a non-conductor between the jacket and cylinder, but was told this was not good for that purpose, and so now I've come to you for advice. If plaster of Paris is suitable, shall I let it come in contact with the cylinder, or leave an air space of half an inch or so? If this is not a suitable filling, what is? A. Air is better to fill the space under the lagging than plaster of Paris. If you wish to use any filling, asbestos is the best. 2. I have store house with a single layer of boards for a roof. Over each joint I have a narrow piece of corrugated roofing iron, bent in a half circle and flanged out on each side and fastened with shingle nails. I have applied a coat of pitch over this, but it still leaks. What can I do to prevent it from leaking? A. The iron battens upon a board roof are not reliable. They are always upon the move by expansion and contraction from variations in temperature, thereby breaking the pitch joints. By adding a little lard oil to the pitch, just enough to keep it from cracking when cold—brush it on hot and saturate with sand—you may make your roof tight.

(15) G. H.—The breaking strain of iron varies from 40,000 to 50,000 pounds per square inch section, from which you may compute the value of your areas. The cost would depend on how you bought as well as quality. You had better consult a blacksmith about the many other calculations you ask.

(16) R. B. says: 1. Take a bolt in the flange of a cylinder, screw the nut down on the cover until you bring a tensile strain of 1,000 pounds upon the bolt, then give a pressure in the cylinder which will bring a strain of 1,000 pounds upon the same bolt, do you get a combining strain of 2,000 pounds on this bolt, or is the strain only 1,000 pounds? A. Under your statement the initial pressure will be 2,000 pounds, but if the bolt be small its threads will set, or the surfaces so unite under the pull, that the united pressure upon the threads will be diminished. 2. Also take the sides of a "water leg" on a boiler with a stay bolt holding them together, having 90 pounds pressure inside, would this stay bolt sustain a tensile strain of 90 pounds, or would the boiler pressure on both sides double the strain? A. In a water leg the strain of 90 pounds on one head of the stay bolt is balanced by the 90 pounds upon the other head, and the bolt is only under a tensile strain of 90 pounds—as a man may pull 90 pounds upon a rope attached to a post, and the strain will not be any different if another man take the place of the post and pulls just 90 pounds.

(17) W. F. V.—The arms of pulleys are curved to prevent cracking in casting from unequal shrinkage. The forms of curve are matters of fancy. It makes no difference as to which way they run, but looks shipshape to have all pulleys in a room or shop with their curved arms running the same way.

(18) H. S. asks: What material is used by architects and masons for cleaning Croton brick work of the marks and scratches made in the building? A. Hydrochloric acid (muriatic acid) is used for this purpose.

(19) H. Q. H. asks: 1. How many feet of compressed air can a tank 16x6x6 feet contain, tank made of one-sixteenth inch plate of iron? A. Tank will hold about 200 cubic feet, and will not be safe for more than 4 pounds pressure, which will enable you to utilize not more 20 cubic feet for your whistle, when the pressure will be reduced to 2 pounds. 2. How many feet of compressed air will a whistle 8 inches diameter use per minute? A. 3 to 6 cubic feet per minute, according to construction of whistle. 3. What distance do you think this whistle can be heard at? A. Possibly one-quarter of a mile.

(20) W. B. A. asks about making cement piping for conveying spring water? A. If you have but little pressure upon the cement pipe that you propose to make, you may make the pipe over a spindle of hard wood, slightly taper, just enough to allow it to be drawn out of the cement. Make a groove at the bottom of the ditch as nearly straight as possible, lay in the groove a course of cement of the thickness that you propose to make the tube; upon this lay the wooden spindle well oiled with linseed oil, then cover the spindle with cement. Proceed to make a second bed of cement, and draw the spindle forward nearly its length and cover with cement as before. The spindle may be from 3 to 5 ft. long; make the pipe from 1 to 2 in. thick, or for small pipe as thick as the diameter of the hole. Use pure Portland cement and water. Mix quickly and as thick as stiff mortar.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

D. M. S.—The specimens are limestone—calcium carbonate—colored red by the admixture of a little hematite or iron oxide.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 22, 1884,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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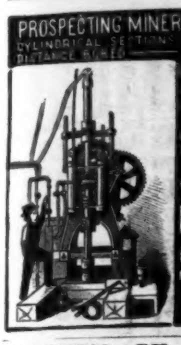

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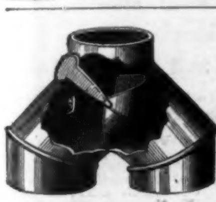

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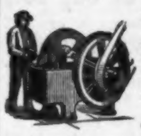

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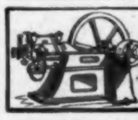

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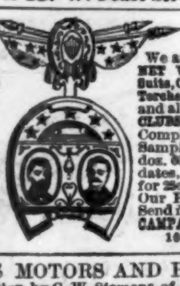

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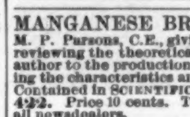

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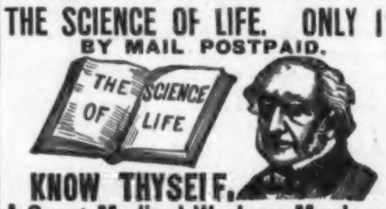

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